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Hypervelocity Technology Escape System Concepts

Volume II. Software Manual

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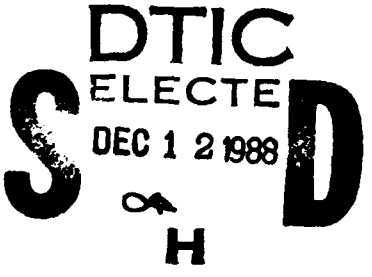

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This technical report has been reviewed and is approved for publication.

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)

This report documents the software developed during the "Hypervelocity Technology Escape System Concepts" program for dynamic simulation and display of various escape system concepts. It contains a description of the new EASY5 component subroutines and the model file used for analysis. The description includes associated mathematical background, flowcharts, input/output variables, and source code listings. The data used to generate the graphic models of the selected escape concepts are also provided. Technical engineering support to AFWAL/FIER was provided by the Aeromechanics Division of the Flight Dynamics Laboratory (AFWAL/FIM) and by the Biodynamic Protection Branch of the Harry Armstrong Aerospace Medical Research Laboratory (AAMRL/BBP). Additionally AAMRL/BBP provided partial funding during FY86 under Program Element No. 62202F, Project No. 7231 Task No. 31 Work Unit Accession No. 114.

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1.0 INTRODUCTION

This report documents the software developed during United States Air Force (USAF) Contract F33615-86-C-3410, "Hypervelocity Technology Escape System Concepts." The objective of the program was to develop and evaluate crew escape concepts for hypervelocity vehicles capable of transatmospheric missions.

The subroutines developed to simulate additional escape systems components, compatible with EASY5 computer code (Reference 1), are described in Section 2.0. The model file developed to simulate orbital escape condition is discussed in Section 3.0. The data used for generating computer-aided design (CAD) color graphic models of the selected escape concepts are discussed in Section 4.0.

2.0 NEW EASY5 COMPONENT SUBROUTINES

The EASY5 component subroutines modified or added under this program include:

- Component RE to calculate the radiative equilibrium temperature of a spherical surface.
- Component AS to calculate the aerodynamic forces and moments on the various escape system concepts. Additional subroutines AERO and TAERO support calculations required by AS.

These subroutines are described in the following subsections.

2.1 COMPONENT SUBROUTINE RE

For the stagnation region of a spherical surface moving at hypersonic speed, the component subroutine RE provides the following information:

a. It calculates the radiative equilibrium temperature of the surface using the equations described in Section 2.1.1.

b. It calculates the heating rate of the surface based on the estimated surface temperature or the radiative equilibrium temperature, whichever is less.

2.1.1 Mathematical Background

The stagnation temperature, t_o, for a vehicle moving through air (Figure 2.1-1) is given by:

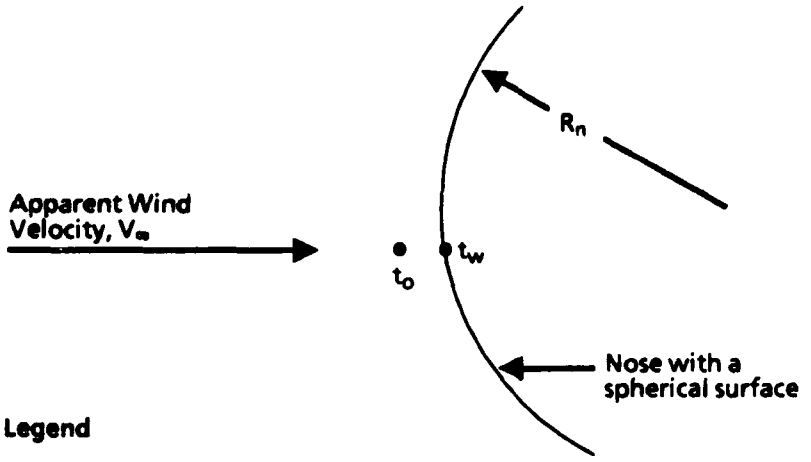
$$t_o = t_\infty + \frac{V_\infty^2}{2C_p g_c} \qquad (2\text{-}1)$$

where: t_∞ = ambient temp, °R

V_∞ = vehicle velocity, ft/sec

C_p = specific heat at constant pressure, $\frac{ft.lb_f}{lb_m.°R}$

g_c = a constant equal to 32.174 $\frac{lb_m.ft}{sec^2.lb_f}$



Legend

R_n = Nose radius

t_o = Stagnation temperature

t_w = Wall temperature

Figure 2.1-1. Nose Geometry for Component Subroutine RE.

The flow is laminar in the stagnation region. Therefore, the heat transfer coefficient h is given by:

$$h = \frac{.1055}{\sqrt{R_n}} \sqrt{\frac{\rho_\infty}{\rho_o}} \left(\frac{V_\infty}{10{,}000}\right)^{1.16} \qquad (2\text{-}2)$$

where: R_n = nose radius, ft.

ρ_o = sea level air density, slug/ft^3

ρ_∞ = ambient air density, slug/ft^3

At the radiative equilibrium temperature, the heat gained by convection is equal to the heat dissipated by radiation. Thus,

$$Q = h(t_o - t_w) = E\varepsilon t_w^4 \qquad (2\text{-}3)$$

where: Q = heat transfer rate, Btu/sec

t_w = radiative equilibrium wall temperature, °R

E = Stefan-Boltzmann constant ($.476 \cdot 10^{-12}$ $\frac{\text{Btu}}{\text{sec.ft}^2.\text{R}^4}$)

ε = emissivity of the surface material

An iterative procedure is used to solve Equations (2-1), (2-2), and (2-3) for the radiative equilibrium wall temperature t_w. This wall temperature is then used to calculate the heat transfer rate using Equation (2-3).

The flowchart for subroutine RE is given in Figure 2.1-2.

2.1.2 Input and Output Data

The input and output data for component subroutine RE are listed in Table 2.1-1.

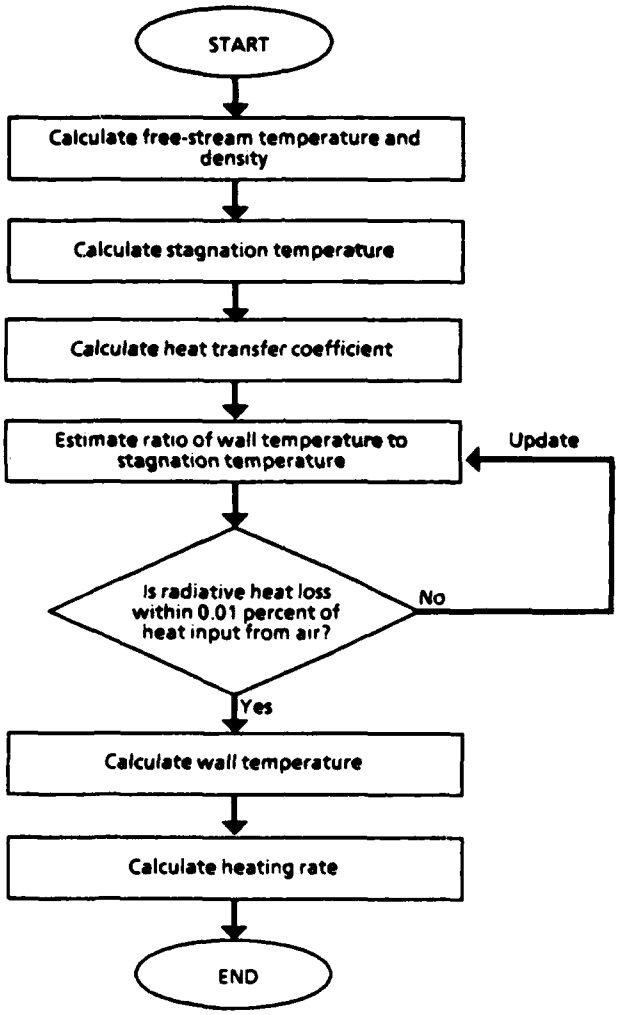


Figure 2.1-2. Flowchart for Component Subroutine RE.

Table 2.1-1. Component RE Data List

Input			
Physical quantity name	Port number	Description	Units
V	-	Velocity of vehicle	ft/sec
RN	-	Nose radius	ft
EM	-	Surface emissivity of the nose	-
ALT	-	Specified altitude of the vehicle	ft
G	-	Inertia proportionality factor equal to 32.2	$\frac{lb_m.ft}{lb_f.sec^2}$
CP	-	Specific heat of the air at the specified altitude	$\frac{ft.lb_f}{lb_m.°R}$
SWIRE	-	Giving this variable a value greater than 1.0 will indicate that the same surface was evaluated at previous call to RE and that the iteration process should use the previously interated value. When the surface under consideration changes, set the value to less than 1.0	-
TWEST	-	The estimated surface temperature	deg R
BP	-	The barometric pressure at the reference altitude for a non-standard atmosphere	in Hg
TE	-	Air temperature at the reference altitude for a non-standard atmosphere	deg R
Output			
Physical quantity name	Port number	Description	Units
TW	-	The radiative equilibrium temperature of the surface	deg R
TO	-	Freestream temperature of the air at the specified altitude	deg R
Q	-	The heating rate of the surface based on the lesser value between the radiative equilibrium temperature and the estimated surface temperature	$\frac{BTU}{ft^2.sec}$

2.1.3 Subroutine RE Source Code

A listing of subroutine RE source code is provided in Appendix A.

2.2 COMPONENT SUBROUTINE AS

The existing subroutine for component AS in the EASY5 computer program was modified slightly to allow for the variation in the aerodynamic data for the different escape concepts. The modifications consist of the following:

a. Tables for aerodynamic coefficients have been removed from Subroutine AS.

b. Instead of calling Subroutine TLU for table lookup of aerodynamic coefficients using packed tabular data, a new subroutine TAERO is called for table lookup of aerodynamic coefficients. Subroutine TAERO accesses the unpacked aerodynamic data in Subroutine AERO automatically through COMMON blocks.

c. The escape system is assumed to be in free stream.

Thus, in order to use the new component Subroutine AS, Subroutines AERO and TAERO must be provided as part of the EASY5 library.

2.2.1 Mathematical Background

If u_x, u_y and u_z are velocity components of an escape system with respect to wind along x, y and z axes respectively, then:

$$\alpha = \tan^{-1} (u_z/u_x) \tag{2-4}$$

$$\beta = \tan^{-1} (u_y/u_x) \tag{2-5}$$

$$q = 0.5\ \rho_\infty\ (u_x^2 + u_y^2 + u_z^2) \tag{2-6}$$

$$M = (u_x^2 + u_y^2 + u_z^2)^{0.5}/V_s \tag{2-7}$$

where:

α = angle of attack, deg
β = sideslip angle, deg
q = dynamic pressure, lb_f/ft^2
ρ_∞ = ambient air density, $slug/ft^3$
M = Mach number
V_S = sonic speed

After determining the values of α, β, and M, stored tables for aerodynamic data are interpolated to calculate the corresponding values of aerodynamic force and moment coefficients. Then for each axis:

$$F = C_F qS \tag{2-8}$$

$$T = C_T qSL \tag{2-9}$$

where:

F = force in the axis of interest
C_F = aerodynamic force coefficient in that axis
S = reference area
T = torque in that axis
C_T = aerodynamic torque coefficient in that axis
L = reference length

The flowchart for Subroutine AS is given in Figure 2.2-1. The flowchart for Subroutine TAERO called by AS for determination of aerodynamic coefficients is provided in Figure 2.2-2. Subroutine AERO has the required tables for the aerodynamic data, but does not do any calculations. Thus, there is no flowchart for Subroutine AERO.

2.2.2 Input and Output Data

The input and output data for the component Subroutine RE are listed in Table 2.2-1.

2.2.3 Subroutine Source Code

A listing of the source code for the component Subroutine AS and the associated Subroutines AERO and TAERO is provided in Appendix A.

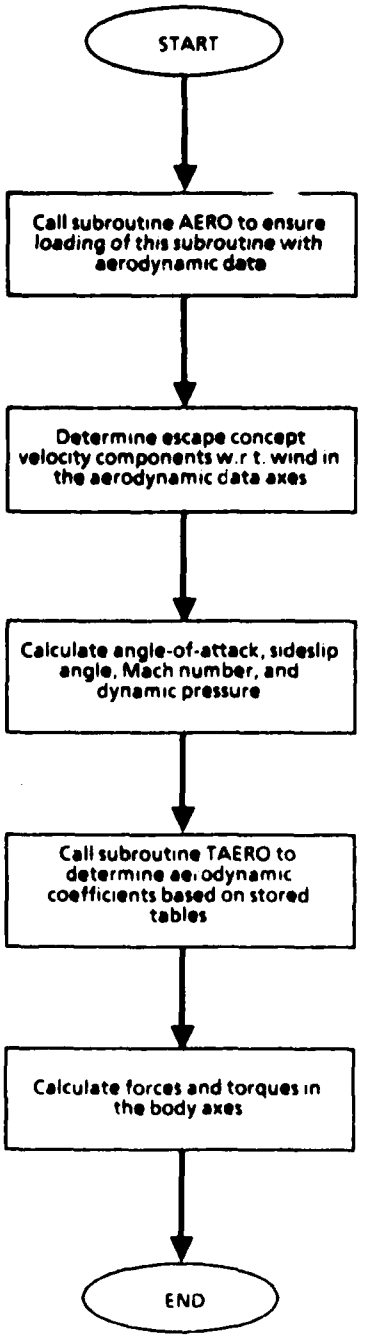


Figure 2.2-1. Flowchart for Component Subroutine AS.

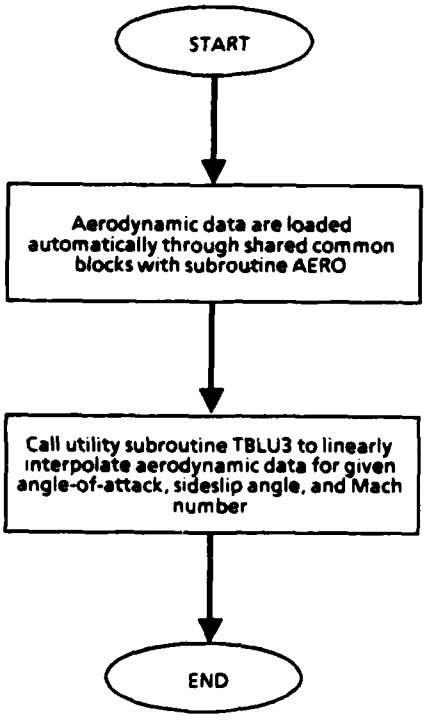


Figure 2.2-2. Flowchart for Subroutine TAERO.

Table 2.2-1. Component AS Data List

Input			
Physical quantity name	Port number	Description	Units
UST (3)	–	Velocity w.r.t. earth surface in the x, y, z body axes	ft/sec
EST (3)	–	Relative Euler angles of earth to body	deg
SRP (3)	–	Position vector w.r.t. earth system along x, y, z	ft
S	–	Reference area	ft^2
RL	–	Reference length	ft
RON	–	Specifies the number of the aero data tables to be used	–
ARP	–	Position vector of the cg w.r.t. to the reference point	ft
PHI	–	The angle between the x axis that the aero data is given in and the longitudinal axis (standard x-axis)	deg
Output			
Physical quantity name	Port number	Description	Units
FA (3)	–	Aerodynamic forces in the x, y, and z body axes	lbs
TA (3)	–	Aerodynamic torques in the x, y, and z body axes	ft-lbs
ALF	–	Angle of attack	deg
BET	–	Sideslip angle	deg
Q	–	Dynamic pressure	$lbs\text{-}ft^2$
QS	–	Dynamic pressure times reference area	lbs
VS	–	Sonic speed	ft/sec
MOC	–	Mach number	–

3.0 MODEL FILE FOR DYNAMIC SIMULATION

The dynamic simulations of the various escape concepts were conducted using EASY5 computer program (Reference 1). Usage of EASY5 program requires creation of model and analysis files to describe the system to be analyzed. Two different types of model files were used for analysis.

The first type of model file for the encapsulated seats or the capsules was essentially the same as that used on the CREST program for ejection seat technology development (Reference 2). These model files were used for simulating all atmospheric escape conditions, and provided six-degree-of-freedom simulations with the control law and propulsion system characteristics simulated in detail.

The dynamic analysis for the orbital escape condition had to be made significantly simpler than that for the atmospheric escape conditions to avoid excessively high computation times. A new model file was, therefore, developed under this program to simulate the orbital escape condition. This model file is discussed in more detail in the following paragraphs.

3.1 MATHEMATICAL BACKGROUND

The following assumptions were made in the development of the model file for orbital escape simulation:

a. The escape system maintains the desired angle of attack, specified as a function of altitude, during reentry into the atmosphere, so that the relatively fast dynamics of the controller and the propulsion system does not have to be simulated.

b. The spin velocity of the earth can be neglected with minimal effect on the parameters of interest such as altitude, Mach number, acceleration or heating rate time histories.

The flowchart for this model file is shown in Figure 3.1-1. Most of the calculations are done in standard EASY5 components AG, AS, SE, RE and IN. The mathematical equations used in these components are provided in Reference 1 or Section 2.0. The required modification to accelerative forces in an associated FORTRAN block is discussed below.

The gravitational force on an escape system due to earth is given by the equation:

$$\text{gravitational force} = \frac{W}{32.174} \quad \frac{1.4077 \cdot 10^{16}}{(2.0925 \cdot 10^{7} + h)^{2}} \qquad (3\text{-}1)$$

where:

W = Weight of the escape system at mean sea level, lbs.
h = Altitude of the escape system above mean sea level, ft.

A gravitational force equal to W is built into the component Subroutine SE. Thus, a correction to this gravitational force needs to be supplied to component SE. This correction in gravitational force is equal to the gravitational force from Equation (3-1) minus W.

A corrective force to allow for centrifugal force need also to be supplied to component Subroutine SE. The centrifugal force on the escape system can be calculated from the following equation:

$$\text{centrifugal force} = \frac{W}{32.174} \quad \frac{v^{2}}{(2.0925 \cdot 10^{7} + h)} \qquad (3\text{-}2)$$

where v is the velocity component of the escape system in the local horizontal plane.

3.2 SOURCE CODE

A listing of the source code for the model file used for orbital escape simulation is provided in Appendix B.

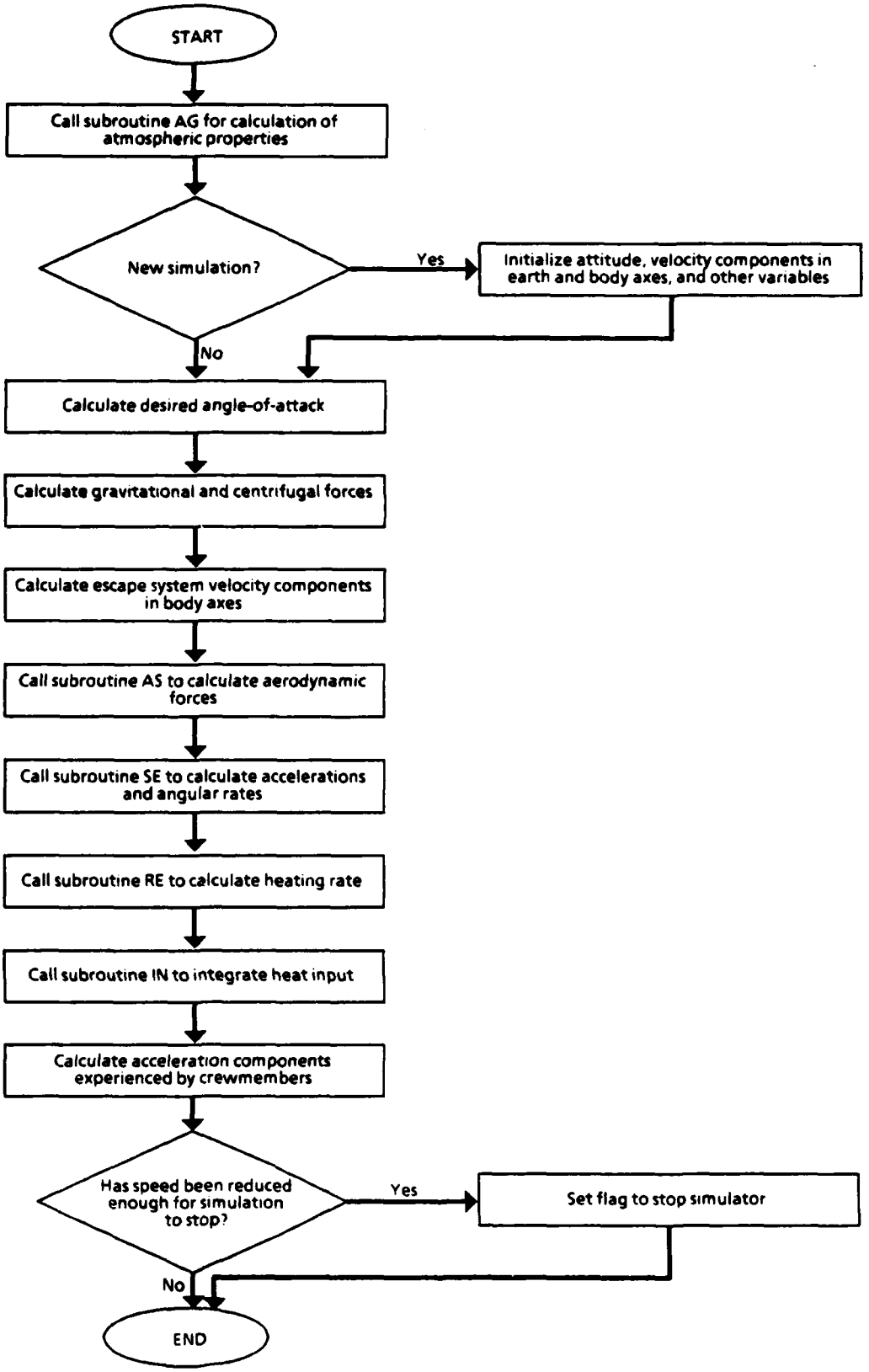


Figure 3.1-1. Flowchart for Model File Used for Orbital Escape Simulation.

4.0 DATA FOR GRAPHIC MODELS

As part of the Hypervelocity Technology Escape System Concepts program, the CADC software package (Reference 3) provided by USAF was used for generating color graphic models of the selected escape system concepts. The selected concepts included a dual-place encapsulated seat for the horizontally-launched vehicle (HLV) and a single-place encapsulated seat for the vertically-launched vehicle. The collection of data used to generate these graphic models by applying the CADC software package is provided in Appendix C.

REFERENCES

1. West, C. L., et al., "Analysis of Ejection Seat Stability Using EASY Program," AFWAL-TR-80-3014, September 1980.

2. USAF Contract F33615-84-C-0518, "Crew Escape Technologies (CREST) Advanced Development Technology Program," April 1984.

3. Evers, J. E., "CIMS CADC User's Guide, Procedures for Using the CADC Software and Manual," Computer Integrated Manufacturing Systems, 1987.

LIST OF ABBREVIATIONS

CAD	Computer Aided Design
CREST	Crew Escape Technologies
HLV	Horizontally Launched Vehicle
HVT	Hypervelocity Technology
USAF	United States Air Force
VLV	Vertically Launched Vehicle

APPENDIX A

SUBROUTINE SOURCE CODE

This Appendix lists the source code for Subroutines AERO, AS, RE, and TAERO in that order. Five different versions of Subroutine AERO are provided. These versions of AERO correspond to the aerodynamic data for single-place encapsulated seat, dual-place encapsulated seat, HLV capsule with wings deployed, HLV capsule without wing deployment, and VLV capsule.

```
      SUBROUTINE AERO
C   FILE NAME: ARODAT1
C
C  THIS SUBROUTINE CONTAINS THE AERODYNAMIC DATA FOR
C  HYPERVELOCITY ESCAPE CONCEPT NUMBER:  1  (SINGLE
C  ENCAPSULATED SEAT)
C
C
C  THE COEFFICIENTS ARE DEFINED AS FOLLOWS:
C
C        CX = X FORCE COEFFICIENT
C        CY = Y FORCE COEFFICIENT
C        CZ = Z FORCE COEFFICIENT
C        CL = X MOMENT COEFFICIENT
C        CM = Y MOMENT COEFFICIENT
C        CN = Z MOMENT COEFFICIENT
C
C  THE GIVEN VALUES ARE REPRESENTATIVE FOR A RANGE OF
C  MACH NUMBERS FROM 0.6 TO 20, ANGLES OF ATTACK FROM
C  -90 TO 90 DEG. AND A SIDE SLIP ANGLE OF 0.0 DEG..
C
      COMMON/AERPARM/RMACH(7),VALPHA(7),VBETA(1)
      COMMON/AERO1/CX(7,7,1)
      COMMON/AERO2/CY(7,7,1)
      COMMON/AERO3/CZ(7,7,1)
      COMMON/AERO4/CL(7,7,1)
      COMMON/AERO5/CM(7,7,1)
      COMMON/AERO6/CN(7,7,1)
    DATA (RMACH (I),I=1,7)/0.6,0.9,1.2,4.0,10.0,15.0,20.0/
    DATA (VALPHA (I),I=1,7)/-90.,-60.,-30.,0.,30.,60.,90/
    DATA VBETA(1)/1.0/
    DATA ((CL(I,J,1),I=1,7),J=1,7) /49*0./
    DATA ((CN(I,J,1),I=1,7),J=1,7) /49*0./
    DATA ((CY(I,J,1),I=1,7),J=1,7) /49*0./
   DATA((CX(I,J,1),I=1,7),J=1,7)/
  *-0.3600,-0.4600,-0.6400,-0.6010,-0.5360,-0.5270,-0.5240,
  * 0.2200, 0.2400, 0.2100, 0.2080, 0.2320, 0.2270, 0.2160,
  *0.4650, 0.5550, 0.7750, 0.6680, 0.6090, 0.5970, 0.5850,
  *0.7950, 0.9390, 1.1950, 1.0960, 0.9860, 0.9650, 0.9490,
  *1.0650, 1.2450, 1.5140, 1.4130, 1.3360, 1.3130, 1.2870,
  * 0.9200, 1.0600, 1.3800, 1.2670, 1.1880, 1.1400, 1.0830,
  * 0.5800, 0.7200, 0.8800, 0.8280, 0.7680, 0.7540, 0.7430/
   DATA((CZ(I,J,1),I=1,7),J=1,7)/
  *-3.4500,-3.4500,-3.6250,-3.3260,-3.1020,-2.9800,-2.838,
  *-2.5500,-2.5500,-2.6000,-2.4640,-2.2890,-2.2530,-2.2110,
  *-1.0850,-1.0850,-1.1000,-0.9600,-0.8530,-0.8340,-0.8220,
  * 0.5550, 0.5550, 0.5810, 0.5210, 0.4430, 0.4340, 0.4290,
  * 2.4600, 2.4600, 2.5800, 2.2120, 2.0090, 1.9740, 1.9480,
  * 3.7000, 3.7000, 3.8250, 3.5620, 3.3520, 3.2400, 3.1140,
  * 3.7000, 3.7000, 3.8500, 3.6170, 3.4050, 3.2770, 3.1250/
   DATA((CM(I,J,1),I=1,7),J=1,7)/
  * 0.2250, 0.2250, 0.2450, 0.1930, 0.1670, 0.1670, 0.1690,
  * 0.0600, 0.0600, 0.0850, 0.0120,-0.0170,-0.0220,-0.0230,
  * 0.1040, 0.1040, 0.1360, 0.0845, 0.0660, 0.0650, 0.0650,
  * 0.2480, 0.2480, 0.2780, 0.2270, 0.2330, 0.2310, 0.2280,
  * 0.1940, 0.1940, 0.2420, 0.1170, 0.1480, 0.1450, 0.1360,
  *-0.3700,-0.3700,-0.3800,-0.3590,-0.3320,-0.3330,-0.3380,
  *-0.6950,-0.6950,-0.7200,-0.6610,-0.6250,-0.5880,-0.5390/
     RETURN
     END
```

```
      SUBROUTINE AERO
C     FILE NAME: ARODAT2
C
C     THIS SUBROUTINE CONTAINS THE AERODYNAMIC DATA FOR
C     HYPERVELOCITY ESCAPE CONCEPT NUMBER: 2  (DUAL
C     ENCAPSULATED SEAT)
C
C
C     THE COEFFICIENTS ARE DEFINED AS FOLLOWS:
C          CX = X FORCE COEFFICIENT
C          CY = Y FORCE COEFFICIENT
C          CZ = Z FORCE COEFFICIENT
C          CL = X MOMENT COEFFICIENT
C          CM = Y MOMENT COEFFICIENT
C          CN = Z MOMENT COEFFICIENT
C    THE GIVEN VALUES ARE REPRESENTATIVE FOR A RANGE OF
C    MACH NUMBERS FROM 0.6 TO 20, ANGLES OF ATTACK FROM
C    -90 TO 90 DEG., AND A SIDE SLIP ANGLE OF 0.0 DEG..
C
      COMMON/AERO1/CX(7,7,1)
      COMMON/AERO2/CY(7,7,1)
      COMMON/AERO3/CZ(7,7,1)
      COMMON/AERO4/CL(7,7,1)
      COMMON/AERO5/CM(7,7,1)
      COMMON/AERO6/CN(7,7,1)
      COMMON/AERPARM/RMACH(7),VALPHA(7),VBETA(1)
     DATA(RMACH(I),I=1,7)/.6,.9,1.2,5.,10.,15.,20./
     DATA(VALPHA(I),I=1,7)/-90.,-60.,-30.,0.,30.,60.,90./
     DATA VBETA(1)/1.0/
      DATA ((CL(I,J,1),I=1,7),J=1,7) /49*0./
      DATA ((CN(I,J,1),I=1,7),J=1,7) /49*0./
      DATA ((CY(I,J,1),I=1,7),J=1,7) /49*0./
     DATA((CX(I,J,1),I=1,7),J=1,7)/
    *-0.2800,-0.3800,-0.6000,-0.5170,-0.4740,-0.4650,-0.4610,
    * 0.2200, 0.2100, 0.1600, 0.1850,-0.1960,-0.1920,-0.1830,
    * 0.3290, 0.4500, 0.6300, 0.5550, 0.5260, 0.5150, 0.5150,
    * 0.6390, 0.7640, 0.9800, 0.9010, 0.8480, 0.8280, 0.8280,
    * 0.9090, 1.0450, 1.2850, 1.1910, 1.1510, 1.1320, 1.1320,
    * 0.8000, 0.9400, 1.1600, 1.0770, 1.0300, 0.9900, 0.9410,
    * 0.4600, 0.5900, 0.8000, 0.7190, 0.6780, 0.6650, 0.6550/
     DATA((CZ(I,J,1),I=1,7),J=1,7)/
    *-2.9500,-2.9500,-3.0000,-2.8820,-2.7450,-2.6360,-2.5090,
    *-2.2000,-2.2000,-2.2750,-2.1060,-2.0260,-1.9920,-1.9570,
    *-0.9400,-0.9400,-0.9700,-0.8030,-0.7470,-0.7310,-0.7310,
    * 0.2900, 0.2900, 0.2850, 0.4190, 0.3820, 0.3740, 0.3740,
    * 1.9850, 1.9850, 2.0150, 1.8630, 1.7600, 1.7300, 1.7300,
    * 3.2000, 3.2000, 3.2500, 3.0810, 2.9620, 2.8670, 2.7610,
    * 3.2500, 3.2500, 3.3000, 3.1560, 3.0210, 2.9080, 2.7750/
     DATA((CM(I,J,1),I=1,7),J=1,7)/
    * 0.1800, 0.1800, 0.2100, 0.1680, 0.1540, 0.1540, 0.1560,
    * 0.0200, 0.0200, 0.0400, 0.0040,-0.0110,-0.0150,-0.1600,
    * 0.0880, 0.0880, 0.1110, 0.0670, 0.0590, 0.0580, 0.0580,
    * 0.2060, 0.2060, 0.2360, 0.1960, 0.1990, 0.1980, 0.1980,
    * 0.1320, 0.1320, 0.1720, 0.1060, 0.1170, 0.1140, 0.1140,
    *-0.3300,-0.3300,-0.3900,-0.3210,-0.3100,-0.3100,-0.3150,
    *-0.5950,-0.5950,-0.6150,-0.5770,-0.5590,-0.5260,-0.4850/
       RETURN
       END
```

```
      SUBROUTINE AERO
C     FILE NAME: ARODAT3
C
C    THIS SUBROUTINE CONTAINS THE AERODYNAMIC DATA FOR
C    HYPERVELOCITY ESCAPE CONCEPT NUMBER: 3  (HLV CAPSULE
C    WITH WINGS DEPLOYED)
C
C
C   THE COEFFICIENTS ARE DEFINED AS FOLLOWS:
C
C     CX = X FORCE COEFFICIENT
C     CY = Y FORCE COEFFICIENT
C     CZ = Z FORCE COEFFICIENT
C     CL = X MOMENT COEFFICIENT
C     CM = Y MOMENT COEFFICIENT
C     CN = Z MOMENT COEFFICIENT
C
C    THE GIVEN VALUES ARE REPRESETATIVE FOR A RANGE OF
C    MACH NUMBERS FROM 0.6 TO 20, ANGLES OF ATTACK FROM
C    -30 TO 30 DEG., AND SIDE SLIP ANGLE OF 0.0 DEG..
C
      COMMON/AERO1/CX(7,3,1)
      COMMON/AERO2/CY(7,3,1)
      COMMON/AERO3/CZ(7,3,1)
      COMMON/AERO4/CL(7,3,1)
      COMMON/AERO5/CM(7,3,1)
      COMMON/AERO6/CN(7,3,1)
      COMMON/AERPARM/RMACH(7),VALPHA(3),VBETA(1)
      DATA(VALPHA(I),I=1,3)/-30.,0.,30./
      DATA(RMACH(I),I=1,7)/0.6,0.9,1.2,4.,10.,15.,20./
      DATA VBETA(1)/1.0/
     DATA ((CL(I,J,1),I=1,7),J=1,3) /21*0./
     DATA ((CN(I,J,1),I=1,7),J=1,3) /21*0./
     DATA ((CY(I,J,1),I=1,7),J=1,3) /21*0./
     DATA((CX(I,J,1),I=1,7),J=1,3)/
     * 0.6600, 0.7600, 0.9400, 0.8765, 0.8013, 0.7868, 0.7704,
     * 0.6600, 0.7800, 1.0000, 0.9224, 0.8351, 0.8129, 0.7896,
     * 0.5800, 0.6900, 0.8800, 0.7968, 0.7388, 0.7254, 0.7090/
     DATA((CZ(I,J,1),I=1,7),J=1,3)/
     *-2.3000,-2.3000,-2.4000,-1.7978,-1.5585,-1.5254,-1.5072,
     *-0.0200,-0.0200,-0.0200,-0.0605,-0.0265,-0.0222,-0.0207,
     * 1.6800, 1.6800, 1.7000, 1.4787, 1.2634, 1.2338, 1.2170/
     DATA((CM(I,J,1),I=1,7),J=1,3)/
     * 0.0245, 0.0245, 0.0290, 0.0244, 0.0112, 0.0121, 0.0143,
     * 0.0190, 0.0190, 0.0225, 0.0176, 0.0044, 0.0029, 0.0024,
     * 0.0925, 0.0925, 1.2000, 0.0793, 0.0815, 0.0792, 0.0765/
      RETURN
      END
```

```
      SUBROUTINE AERO
C
C     THIS SUBROUTINE CONTAINS THE AERODYNAMIC DATA FOR
C     HYPERVELOCITY ESCAPE CONCEPT NUMBER:  4 (HLV CAPSULE
C     WITHOUT WING DEPLOYED)
C
C
C   THE COEFFICIENTS ARE DEFINED AS FOLLOWS:
C
C         CX = X FORCE COEFFICIENT
C         CY = Y FORCE COEFFICIENT
C         CZ = Z FORCE COEFFICIENT
C         CL = X MOMENT COEFFICIENT
C         CM = Y MOMENT COEFFICIENT
C         CN = Z MOMENT COEFFICIENT
C
C    THE GIVEN COEFFICIENTS ARE REPRESTATIVE FOR A RANGE OF
C    MACH NUMBERS FROM 0.6 TO 20, ANGLES OF ATTACK FROM -30
C    TO 30 DEG., AND A SIDE SLIP ANGLE OF 0.0 DEG..
C
      DIMENSION CX(7,3,1),CY(7,3,1),CZ(7,3,1),
     +          CL(7,3,1),CM(7,3,1),CN(7,3,1)
      COMMON/AERO1/CX
      COMMON/AERO2/CY
      COMMON/AERO3/CZ
      COMMON/AERO4/CL
      COMMON/AERO5/CM
      COMMON/AERO6/CN
      COMMON/AERPARM/RMACH(7),VALPHA(3),VBETA(1)
      DATA(RMACH(I),I=1,7)/0.6,0.9,1.2,4.,10.,15.,20./
      DATA(VALPHA(I),I=1,3)/-30.,0.,30./
      DATA VBETA(1)/1.0/
      DATA ((CL(I,J,1),I=1,7),J=1,3) /21*0./
      DATA ((CN(I,J,1),I=1,7),J=1,3) /21*0./
      DATA ((CY(I,J,1),I=1,7),J=1,3) /21*0./
     DATA((CX(I,J,1),I=1,7),J=1,3)/
     * 0.6000, 0.7210, 0.7400, 0.8770, 0.7970, 0.6890, 0.7730,
     * 0.6600, 0.7810, 0.8000, 0.9320, 0.8410, 0.8080, 0.8090,
     * 0.5400, 0.6580, 0.6690, 0.8230, 0.7590, 0.6690, 0.7360/
     DATA((CZ(I,J,1),I=1,7),J=1,3)/
     *-1.5790,-1.5790,-1.6390,-1.4300,-1.2490,-0.9110,-1.2070,
     *-0.0190,-0.0190,-0.0190,-0.0470,-0.0130,-0.0010,-0.0070,
     * 1.4200, 1.4200, 1.4580, 1.1740, 1.0120, 0.4320, 0.9740/
     DATA((CM(I,J,1),I=1,7),J=1,3)/
     * 0.0340, 0.0340, 0.0370, 0.0360, 0.0210,-0.0580, 0.0240,
     * 0.0170, 0.0170, 0.0190, 0.0150, 0.0020,-0.0020, 0.0004,
     * 0.0620, 0.0620, 0.0690, 0.0580, 0.0630, 0.0950, 0.0590/
      RETURN
      END
```

```
      SUBROUTINE AERO
C
C     THIS SUBROUTINE CONTAINS THE AERODYNAMIC DATA FOR
C     HYPERVELOCITY ESCAPE CONCEPT NUMBER: 5 (VLV CAPSULE)
C
C
C     THE COEFFICIENTS ARE DEFINED AS FOLLOWS:
C
C        CX = X FORCE COEFFICIENT
C        CY = Y FORCE COEFFICIENT
C        CZ = Z FORCE COEFFICIENT
C        CL = X MOMENT COEFFICIENT
C        CM = Y MOMENT COEFFICIENT
C        CN = Z MOMENT COEFFICIENT
C
       COMMON/AERO1/CX(7,3,1)
       COMMON/AERO2/CY(7,3,1)
       COMMON/AERO3/CZ(7,3,1)
       COMMON/AERO4/CL(7,3,1)
       COMMON/AERO5/CM(7,3,1)
       COMMON/AERO6/CN(7,3,1)
       COMMON/AERPARM/RMACH(7),VALPHA(3),VBETA(1)
       DATA(RMACH(I),I=1,7)/0.6,0.9,1.2,4.,10.,15.,20./
       DATA(VALPHA(I),I=1,3)/-30.,0.,30./
       DATA VBETA(1)/1.0/
     DATA ((CL(I,J,1),I=1,7),J=1,3) /21*0./
     DATA ((CN(I,J,1),I=1,7),J=1,3) /21*0./
     DATA ((CY(I,J,1),I=1,7),J=1,3) /21*0./
    DATA((CX(I,J,1),I=1,7),J=1,3)/
    * 0.3800, 0.4200, 0.5600, 0.5072, 0.4660, 0.4630, 0.4624,
    * 0.3100, 0.3600, 0.5000, 0.4586, 0.4017, 0.3977, 0.3974,
    * 0.4400, 0.5100, 0.6500, 0.5823, 0.5362, 0.5285, 0.5212/
    DATA((CZ(I,J,1),I=1,7),J=1,3)/
    *-0.9900,-0.9900,-1.0400,-0.8975,-0.8356,-0.8259,-0.8225,
    * 0.0400, 0.0400, 0.0400, 0.0491, 0.0456, 0.0453, 0.0453,
    * 1.1400, 1.1400, 1.1800, 1.0310, 0.9644, 0.9518, 0.9428/
    DATA((CM(I,J,1),I=1,7),J=1,3)/
    * 0.0430, 0.0430, 0.0500, 0.0397, 0.0268, 0.0260, 0.0258,
    * 0.0300, 0.0300, 0.0140, 0.0110, 0.0125, 0.0127, 0.0128,
    *-0.0710,-0.0710,-0.0980,-0.0612,-0.0476,-0.0480,-0.0496/
       RETURN
       END
```

```
      SUBROUTINE AS(FA,TA,ALF,BET,Q,QS,VS,MOC,
     +              UST,EST,SRP,S,RL,RON,ARP,PHI)
C
C*************************************************************
C
C SUBROUTINE AS CALCULATES THE AERODYNAMIC FORCES AND
C TORQUES OF A CAPSULE OR SEAT TYPE CONFIGURATION.
C IT CALLS UPON SUBROUTINE AERO FOR AERODYNAMIC DATA
C AND SUBROUTINE TAERO TO INTERPOLATE THE AERODYNAMIC DATA
C FOR A GIVEN MACH NUMBER, ANGLE OF ATTACK, AND SIDE SLIP
C ANGLE.
C
C  OUTPUTS
C
C      FA(3)-X,Y,Z AERODYNAMIC FORCES IN THE BODY AXES (LBS)
C      TA(3)-X,Y,Z AERODYNAMIC TORQUES IN THE BODY AXES (FT-LBS)
C      ALF-ANGLE OF ATTACK (DEGREES)
C      BET - SIDE SLIP ANGLE (DEGREES)
C      Q    - DYNAMIC PRESSURE (LBS-FT**2)
C      QS   - Q X S  (LBS)
C      VS   - SONIC SPEED (FT/SEC)
C      MOC   - MACH NUMBER
C
C   INPUTS:
C
C      UST(3) - X,Y,Z VELOCITY WRT EARTH SURFACE IN THE BODY AXIS.
C     EST(3) - RELATIVE EULER ANGLES OF EARTH TO BODY
C
C      SRP(3) - X,Y,Z POSITION VECTOR WRT EARTH SYSTEM
C      S      - REFERENCE AREA (FT**2)
C      RL     - REFERENCE LENGTH (FT)
C      RON - SPECIFIES THE AERO DATA TABLES TO BE USED
C      ARP - POSITION VECTOR OF THE CG WRT TO THE CRP.
C      PHI  - THE ANGLE BETWEEN THE X AXIS THAT THE AERO
C               DATA IS GIVEN IN AND THE LONGITUDINAL AXIS
C               (STANDARD X-AXIS)
C
C*************************************************************C
        REAL WIN(3),COEFF(6),UST(3),SRP(3),FA(3),TA(3),TAP(3),MOC
      DIMENSION DSA(3,3),UWB(3),UO(3),EST(3),ESTIR(3),ARP(3),TEMP(3)
     DATA RADPD,DEGPR/.01745329,57.29583/
          IF(PHI.EQ.0.99999)PHI=0.
C
       IF(RON.EQ.0.0.OR.RON.EQ..99999)RON=1.
          CALL AERO
          CALL ATMOS(VS,RHO,-SRP(3),WIN,0.0,0.0)
C
C   PUT WIND VELOCITY INTO THE BODY AXIS ..
C
       DO 5 I=1,3
       ESTIR(I)=EST(I)*RADPD
5      CONTINUE
C
         CALL DIRCOS(DSA,ESTIR)
         CALL MATMPY(UWB,DSA,WIN,3,3,1)
         DO 9 I=1,3
         TEMP(I)=UST(I)-UWB(I)
9       CONTINUE
C
C  TRANSFORM BODY FRAME VELOCITIES INTO AEROFRAME VELOCITIES
```

```
C
          UO(1)=TEMP(1)*COSD(PHI)-TEMP(3)*SIND(PHI)
          UO(2)=TEMP(2)
          UO(3)=TEMP(1)*SIND(PHI)+TEMP(3)*COSD(PHI)
           IF (UO(1).EQ.0.0.AND.UO(3).EQ.0.0)UO(1)=.01
           IF (TEMP(1).EQ.0.0.AND.TEMP(3).EQ.0.0)TEMP(1)=.01
           TALF=ARTAN2(UO(3),UO(1))*DEGPR
           ALF=ARTAN2(TEMP(3),TEMP(1))*DEGPR
           CALL DOTPRD(VBAR2,UO,UO,3)
           VBAR=SQRT(VBAR2)
           TBET=ARTAN2(UO(2),UO(1))*DEGPR
           BET=ARTAN2(TEMP(2),TEMP(1))*DEGPR
           MOC=VBAR/VS
           Q=.5*RHO*VBAR2
           QS=Q*S
           CALL TAERO(TALF,TBET,MOC,RON,COEFF)
C
CC   THE COEFFICIENTS ARE WRT BODY AXIS/MULTIPLY BY DYNAMIC PRESSURE
C
       DO 10 I=1,3
         TEMP(I)=COEFF(I)*QS
       TA(I)=COEFF(I+3)*QS*RL
10     CONTINUE
C
CC     CONVERT THE FORCES IN THE AEROFRAME TO THE STANDARD FRAME
C
         FA(1)=TEMP(1)*COSD(PHI)+TEMP(3)*SIND(PHI)
         FA(2)=TEMP(2)
         FA(3)=-TEMP(1)*SIND(PHI)+TEMP(3)*COSD(PHI)
C
CC
CC   THESE TORQUES WRT THE CG, TRANSFER TO CRP
C
       CALL CRSPRD(TAP,FA,ARP)
       DO 15 I=1,3
       TA(I)=TA(I)-TAP(I)
15        CONTINUE
       RETURN
       END
```

```
      SUBROUTINE RE (TW,Q,TO,V,RN,EM,ALT,G,CP,SWIRE,TWEST,BP,TE)
C
C     THIS SUBROUTINE CALCULATES THE RADIATIVE EQUILIBRIUM TEMPERATURE
C     OF A SPHERICAL SURFACE.  THE ARGUMENTS ARE DEFINED AS FOLLOWS:
C
C     OUTPUT:
C       TW = RADIATIVE EQUILIBRIUM TEMPERATURE IN DEG. R
C        Q = HEATING RATE IN BTU/FT**2 SEC OF THE SURFACE
C            BASED UPON THE ESTIMATED SURFACE TEMPERATURE.
C     TO =   FREE STREAM TEMPERATURE OF THE AIR AT THE SPECIFIED
C            ALTITUDE IN DEG. R.
C
C     INPUT:
C        V = VELOCITY IN FT/SEC
C      ALT = ALTITUDE OF VEHICLE (FT)
C       RN = NOSE RADIUS IN FT.
C       EM = SURFACE EMISSIVITY
C        G = ACCELERATION DUE TO GRAVITY
C       CP = SPECIFIC HEAT IN FT*LBF/(LBM*DEG R)
C   SWIRE = A VALUE GREATER THAN 1.0 INDICATES THAT THE SAME SURFACE
C            IS BEING USED AND THAT THE ITERATION PROCESS WILL START
C            AT THE PREVIOUSLY ITERATED VALUE OF K.
C     TWEST = THE ESTIMATED SURFACE TEMPERATURE IN DEG.R
C     BP,TE = BAROMETRIC PRESSURE (IN.), AND SEA LEVEL TEMPERATURE
C            FOR A NON-STANDARD ATMOSPHERE
C
C ********************************************************************
C
      COMMON/CICCAL/ICCAL
      COMMON/TEMP/TK
      REAL KF,KI,WIN(3)
      DATA DENSEA,E,SW/2.377E-3,0.476E-12,1./
C
C        DEFAULT VALUE OF CP IS 186.77 FT*LBF/(LBM*DEG R)
C
      IF(CP.EQ.0.99999.OR.CP.EQ.0.) CP=186.77
C
C
C   CALCULATE THE FREE STREAM TEMPERATURE AND DENSITY,TK AND DENS ...
C
         CALL ATMOS(VS,DENS,ALT,WIN,BP,TE,SW)
C
C
            TO=TK
C        CALCULATE THE STAGNATION TEMPERATURE
C
      TS=TO+V**2/(2*CP*G)
C
C        CALCULATE THE HEAT TRANSFER COEFFICIENT
C
     H=0.1055*(SQRT(DENS/(DENSEA*RN)))*(0.0001*V)**1.15
C
C        THE EQUATIONS USED ARE AS FOLLOWS
C
C           TW = K*TS   WHERE  K**4 = B*(1-K)  AND
C           B = H/(E*EM*TS**3)
C
C
C
```

```
      B=H/(E*EM*TS**3)
C
CC       ITERATE TO FIND THE VALUE OF K
C
      IF(B.GT.3.) GO TO 30
      KI=0.5
      IF(SWIRE.GT.1..AND.ICCAL.NE.1.) KI=KF
   20 AA=((1.-KI)*B)**0.25
      IF(AA.GT.0.85) AA=0.85
      KF=(AA+(KI*KI)*0.25/(1.-KI))/(1.+KI*0.25/(1.-KI))
      DIF=KI-KF
      IF(ABS(DIF).LT.1.0E-4) GO TO 60
      KI=KF
      GO TO 20
   30 KI=0.9
      IF(SWIRE.GT.1..AND.ICCAL.NE.1.) KI=KF
   40 KF=((1.-(KI**4)/B)+3.*KI/B)/(1.+3./B)
      DIF=KI-KF
      IF(ABS(DIF).LT.1.0E-4) GO TO 60
      KI=KF
      GO TO 40
   60 TW=KF*TS
C
CCC      CALCULATE THE HEATING RATE BASED UPON THE ESTIMATED
CC        SURFACE TEMPERATURE.
C
      Q=H*(TS-AMIN1(TWEST,TW))
C
CC
      RETURN
      END
```

```
      SUBROUTINE TAERO(ALPHA,BETA,VMACH,RON,COEFF)
C
CCC   THIS SUBROUTINE CALCULATES THE AERODYNAMIC COEFFICIENTS
CCC   BASED UPON A TABLE LOOK USING AERODATA PROVIDED FROM
CCC   SUBROUTINE AERO USING 21 DATA POINTS.
CCC
CCC   OUTPUTS:
CCC            COEFF(6) - VALUES ARE:
CCC                          CX= X FORCE COEFFICIENT, (+) FORWARD
CCC                          CY= Y FORCE COEFFICIENT
CCC                          CZ= Z FORCE COEFFICIENT,(+) DOWNWARD
CCC                          CL= YAWING MOMENT COEFFICIENT
CCC                          CM= PITCHING MOMENT COEFFICIENT (+) UPWARD
CCC                          CN= ROLLING MOMENT COEFFICIENT
CCC
CCC   INPUTS:
CCC          ALPHA - ANGLE OF ATTACK (DEGREES)
CCC          BETA  - SIDE SLIP ANGLE (DEGREES
CCC          VMACH - MACH NUMBER
CCC          RON   - A DUMMY PARAMETER WHICH CAN BE USED
CCC                  AT THE DISCRESSION OF THE USER.
CCC                  IT WOULD TYPICALLY BE USED TO DISTINGUISH
CCC                  BETWEEN CERTAIN AERODATA SETS TO BE USED WITHIN
CCC                  SUBROUTINE AERO
C
        REAL COEFF(6)
      COMMON/CRON/AROSET
       COMMON/AERO1/CX(7,3,1)
       COMMON/AERO2/CY(7,3,1)
       COMMON/AERO3/CZ(7,3,1)
       COMMON/AERO4/CL(7,3,1)
       COMMON/AERO5/CM(7,3,1)
       COMMON/AERO6/CN(7,3,1)
        COMMON/AERPARM/RMACH(7),VALPHA(3),VBETA(1)
          IF(RON.EQ..99999)RON=1.
          AROSET=RON
          TBETA=ABS(BETA)
C
CCC
C
        COEFF(1)=-TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CX,1,1,1,-7,-3,-1,7,3,1)
        COEFF(2)=TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CY,1,1,1,-7,-3,-1,7,3,1)*SIGN(1.,BETA)
        COEFF(3)=-TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CZ,1,1,1,-7,-3,-1,7,3,1)
        COEFF(4)=TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CL,1,1,1,-7,-3,-1,7,3,1)*SIGN(1.,BETA)
        COEFF(5)=TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CM,1,1,1,-7,-3,-1,7,3,1)
        COEFF(6)=TBLU3(VMACH,ALPHA,TBETA,RMACH,VALPHA,VBETA,
     +    CN,1,1,1,-7,-3,-1,7,3,1)*SIGN(1.,BETA)
          RETURN
          END
```

APPENDIX B

MODEL FILE SOURCE CODE

This Appendix lists the source code for the model file used to simulate the escape concepts during orbital escape.

```
MODEL DESCRIPTION = HYPERVELOCITY AND ORBITER  MODEL
*****     WITH ONLY ALPHA VS ALTITUDE CONTROL ******
****       USING SUBROUTINE SE + GRAVITATIONAL CORRECTION
*****      FORCES + CENTRIPETAL FORCE.
******     FILE NAME = CAPORBT
ALPHABETIZE
*****
* +++ ATMOSPHERE +++
*
LOCATION=010      AG
*
*****
*
*****
* +++ FORT 023--STATE VARIABLE INITIALIZATION
*
*
LOCATION=023    FORT    INPUTS=ESTSE,SRPSE,WSTSE,USTSE
              ADD VARIABLES=DEV(3,3),EVIR(3),DVR(3,3),ERRIR(3)
                            DER(3,3),ESTIRX(3),CI(3,3),VCATE(3)
                            DERINV(3,3),VACE(3),DERSCRP(3,3),ALT
     ADD PARAMETERS=VAV,FPA,VCAT(3)
                    RADPD,DEGPR,EV(3),THR
FORTRAN STATEMENTS
       IF(ICCALC.NE.1) GOTO 60
      /CCGAS/*/0/
           ERRIR(1)=0.
           ERRIR(2)=THR
           ERRIR(3)=0.
           DO 46 I=1,3
            EVIR(I)=EV(I)*RADPD
46         CONTINUE
            CALL DIRCOS(DVR,ERRIR)
            CALL DIRCOS(DEV,EVIR)
            /DER/=/DVR/*/DEV/
            CALL COSDIR(ESTIRX,DER)
            DO 48 I=1,3
48          ESTSE(I)=ESTIRX(I)*DEGPR
C
             VACE(1)=VAV*COSD(FPA)
             VACE(2)=0.
             VACE(3)=-VAV*SIND(FPA)
              /DERSCRP/=/DER/
              /CI/=/1/
              /DERINV/=/DERSCRP/-1/CI/
              /USTSE/=/DER/*/VACE/
              /USTSE/=/USTSE/+/VCAT/
              /VCATE/=/DERINV/*/VCAT/
              /TM SE/=/VACE/+/VCATE/

C
C
   60 CONTINUE
       ALT=-SRPSE(3)
*****
** ++ CONTROLLED ANGLE OF ATTACK +++
******
LOCATION=017          FU5              INPUTS=FORT(ALT=S)
*********
LOCATION=045         FORT              INPUTS=USTSE,S2 FU5
```

```
                                        ADD VARIABLES=VCNTRL(3)
                                      DES(3,3),DSE(3,3),ESTIR(3),VI(3)
                                       CFORCE,CF(3),CT(3),C1,GAMMA
                                    VBAR2,VBAR,FORCE(3),TORQUE(3),F11(3),T11(3)
                                  VI1,VI2,VI3,GRV1,DIS
                           ADD PARAMETER=COND
FORTRAN STATEMENTS
        DO 2 I=1,3
2      ESTIR(I)=ESTSE(I)*RADPD
C
        CALL DIRCOS(DES,ESTIR)
        CALL TRANS(DSE,DES,3,3)
        CALL MATMPY(VI,DSE,USTSE,3,3,1)
         VI1=VI(1)
         VI2=VI(2)
         VI3=VI(3)
         DIS=2.0925E7 -SRPSE(3)
         GRV1=1.4077E16/DIS**2.
         C1=32.174-GRV1
        CFORCE=CW SE*(VI(1)**2 + VI(2)**2)/(32.2*DIS)
     +   + CW SE*C1/(32.174)
C
         DO 3 I=1,3
3        CF(I)=-CFORCE*DES(I,3)
         CALL CRSPRD(CT,CCGSE,CF)
*
          IF(COND.NE 4.)GO TO 6
           CALL DOTPRD(VBAR2,USTSE,USTSE,3)
           VBAR=SQRT(VBAR2)
             GAMMA=ASIN(-VI(3)/(VBAR))*DEGPR
           VCNTRL(1)=VBAR*COSD(S2 FU5)
           VCNTRL(2)=0.
           VCNTRL(3)=VBAR*SIND(S2 FU5)
         DO 5 I=1,3
         F11(I)=0.
         T11(I)=0.
         FORCE(I)=0.
5        TORQUE(I)=0.
          GO TO 8
6        DO 7 I=1,3
7        VCNTRL(I)=USTSE(I)
8        CONTINUE
* +++ FORT 068--MODULE AERODYNAMICS+++
*
*
LOCATION=068       AS          INPUTS=SE(SRP=SRP,EST=EST)
                                      FORT(VCNTRL=UST)
*
*
* +++ CAPSULE +++
*
LOCATION=029     SE          INPUTS=AS(FA=F2,1,TA=T2,1)
                             FORT(F11=F1,1,T11=T1,1
                        FORCE=F1,2,TORQUE=T1,2
                        CF=F2,2,CT=T2,2)
********
**    ++ COMPUTE HEATING RATES
******
*
LOCATION=065         FORT          INPUTS=VBAR,MOCAS
```

```
                          ADD VARIABLES=HETRAT,SWIRE,TO,TW
                          ADD PARAMETERS=RNOZ,EM,SPCH,TWEST,MOCSTOP
FORTRAN STATEMENTS
*
*
             IF(MOCAS.LE.MOCSTOP)ISTOP=1
           IF(ICCALC.EQ.1.OR.TIME.EQ.0.)THEN
             SWIRE=0.
            ELSE
             SWIRE=2.
            END IF
           CALL RE(TW,HETRAT,TO,VBAR,RNOZ,EM,ALT,GRV1,SPCH,SWIRE,TWEST,
     +         BP AG,TE AG)
**
** +++ INTEGRATOR FOR HEATING
*******************
LOCATION=063               IN7       INPUTS=FORT(HETRAT=S)
*****
*** +++ SEAT AXOS TRAMSFPR,ATOPM - FOR RECLINE +++
***
LOCATION=056       FORT          INPUTS=GXASE,WSTSE
                           ADD PARAMETERS=SRANG,SSR,CSR
                           ADD VARIABLES=GXRS(3),GXRS1
                                    SRPSE1,SRPSE2,GXRS2,GXRS3
FORTRAN STATEMENTS
*
           IF(ICCALC.NE.1) GOTO 110
           SSR=SIND(SRANG)
            CSR=COSD(SRANG)
110         CONTINUE
*
            GXRS(1)=GXASE(1)*CSR+GXASE(3)*SSR
            GXRS(2)=GXASE(2)
            GXRS(3)=-GXASE(1)*SSR+GXASE(3)*CSR
            GXRS1=GXRS(1)
            GXRS2=GXRS(2)
            GXRS3=GXRS(3)
            SRPSE1=SRPSE(1)
            SRPSE2=SRPSE(2)
*
END OF MODEL
PRINT
```

APPENDIX C

LIST OF DATA FOR GRAPHIC MODELS

This Appendix lists the data used to generate the graphic models of the single-place encapsulated seat and the dual-place encapsulated seat. These data must be used with the CADC software package using the instructions provided in Reference 3. These data are listed in the order given below. The filenames for the various data correspond to those used for storing these data on the 5 1/4 inch mini-flexible disc provided to USAF.

Filename	Data Description
SS3V119.CAD	Three-view file for the single-place encapsulated seat
SS2V119.DIM	Dimensions file for the single-place encapsulated seat
SEATXL.CAD	Subsystems location file for the single-place encapsulated seat
SEATXN.NOT	Subsystems note file for the single-place encapsulated seat
DS3V.CAD	Three-view file for the dual-place encapsulated seat
DS3V.DIM	Dimensions file for the dual-place encapsulated seat
DSEATXL.CAD	Subsystems location file for the dual-place encapsulated seat
DSEATXN.NOT	Subsystems note file for the dual-place encapsulated seat

Data File SS3V119.CAD: Three-View File for the Single-Place Encapsulated Seat

```
"2.00","","IN",1,0,0
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 10.42002  3.639976  2.384186E-08  0  0  0
 8.500017  3.639976  2.384186E-08  0  0  0
 9.460016  5.290145 -1.192093E-08  0  0  0
 10.39003  3.760144  0  0  0  0
 8.740017  4.570145  0  0  0  0
 10.33002  3.700146  0  0  0  0
 9.430023  5.260147  0  0  0  0
 10.36003  3.730144  2.384186E-08  0  0  0
 8.770021  4.600145  0  0  0  0
 8.50002  3.670146  0  0  0  0
 10.30002  3.670146 -1.192093E-08  0  0  0
 11.32003  5.55998  0  0  0  0
 10.33002  3.579979  0  0  0  0
 8.500017  3.579979  2.384186E-08  0  0  0
 8.560011  3.579802  0  0  0  0
 8.110006  2.379799  0  0  0  0
 8.050009  2.379799  2.384186E-08  0  0  0
 7.93001  1.8398  0  0  0  0
 8.020008  1.809801  0  0  0  0
 7.975015  2.289801  0  0  0  0
 8.050013  2.289801  0  0  0  0
 8.110013  2.439803  0  0  0  0
 8.080013  2.364801  0  0  0  0
 9.22002  2.364801 -1.192093E-08  0  0  0
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 9.295019  3.3998  0  0  0  0
 10.16502  3.2948  0  0  0  0
 10.78002  5.4998  0  0  0  0
 10.72001  5.4998  0  0  0  0
 10.12001  3.429802 -3.576279E-08  0  0  0
 9.310017  3.519801 -1.192093E-08  0  0  0
 10.04501  3.369801  2.384186E-08  0  0  0
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 9.250012  3.4748  0  0  0  0
 9.265013  3.429802  0  0  0  0
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 8.93501  3.384802 -1.192093E-08  0  0  0
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 8.890015  3.714802  2.384186E-08  0  0  0
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 8.845011  3.744802 -1.192093E-08  0  0  0
 8.830011  3.714802  0  0  0  0
 8.800013  3.444802  0  0  0  0
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 10.07501  3.264802  0  0  0  0
 10.07501  2.949801  0  0  0  0
```

```
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10.75001  5.079803  0  0  0  0
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10.98001  5.383133  0  0  0  0
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10.78502  5.204799  0  0  0  0
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11.06501  5.1448 -3.576279E-08  0  0  0
```

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9.974093  2.114638  0  0  0  0
```

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9.460011  1.644802  0  0  0  0
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7.217512  5.562805  0  0  0  0
5.057513  5.562805  0  0  0  0
5.777512  2.292805  0  0  0  0
5.057513  3.012805  0  0  0  0
```

```
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5.057513   2.232803  0  0  0  0
6.49751   1.512805  0  0  0  0
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5.057513   3.582804  0  0  0  0
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7.217513   3.642806  0  0  0  0
7.097513   4.797806  0  0  0  0
7.097513   3.642806  0  0  0  0
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7.097513   3.672805  0  0  0  0
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6.407509   5.037805  0  0  0  0
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6.767513   3.297804  0  0  0  0
5.507513   3.297804  0  0  0  0
5.507513   4.737801  0  0  0  0
5.867514   5.037803  0  0  0  0
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6.191512   5.487803  0  0  0  0
6.299513   5.487803  0  0  0  0
6.407509   5.127805  0  0  0  0
6.407509   5.217805  0  0  0  0
6.407509   5.307804  0  0  0  0
6.407509   5.397805  0  0  0  0
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6.551512   4.917805  0  0  0  0
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6.695511   4.797804  0  0  0  0
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6.767513   3.585803  0  0  0  0
6.767513   3.681805  0  0  0  0
6.767513   3.777804  0  0  0  0
6.767513   3.873803  0  0  0  0
6.767513   3.969802  0  0  0  0
6.767513   4.065805  0  0  0  0
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6.767513   4.257803  0  0  0  0
6.767513   4.353803  0  0  0  0
6.767513   4.449802  0  0  0  0
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6.767513	4.641803	0	0	0	0
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6.080242	3.507803	0	0	0	0
6.194788	3.507803	0	0	0	0
6.309331	3.507803	0	0	0	0
6.423877	3.507803	0	0	0	0
6.538423	3.507803	0	0	0	0
6.652971	3.507803	0	0	0	0
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5.736603	3.297804	0	0	0	0
5.851145	3.297804	0	0	0	0
5.965694	3.297804	0	0	0	0
6.080242	3.297804	0	0	0	0
6.194788	3.297804	0	0	0	0
6.309331	3.297804	0	0	0	0
6.423877	3.297804	0	0	0	0
6.538423	3.297804	0	0	0	0
6.652971	3.297804	0	0	0	0
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5.507513	3.585803	0	0	0	0
5.507513	3.681804	0	0	0	0
5.507513	3.777803	0	0	0	0
5.507513	3.873802	0	0	0	0
5.507513	3.969802	0	0	0	0
5.507513	4.065803	0	0	0	0
5.507513	4.161802	0	0	0	0
5.507513	4.257803	0	0	0	0
5.507513	4.353803	0	0	0	0
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5.507513	4.545803	0	0	0	0
5.507513	4.641803	0	0	0	0
5.579513	4.797802	0	0	0	0
5.651509	4.857801	0	0	0	0
5.723513	4.917804	0	0	0	0
5.795512	4.977804	0	0	0	0
5.867514	5.127804	0	0	0	0
5.867514	5.217805	0	0	0	0
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8.500023	8.27998	0	0	0	0
8.500023	6.119979	0	0	0	0
10.42003	6.119979	0	0	0	0

10.42003	8.27998	0	0	0	0
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10.42003	8.159985	0	0	0	0
10.42003	6.239982	0	0	0	0
9.160025	6.239982	0	0	0	0
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8.845028	6.119979	0	0	0	0
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11.20752	6.959976	0	0	0	0
11.20752	7.439979	0	0	0	0
10.81752	7.439979	0	0	0	0
9.227525	6.569978	0	0	0	0
9.227525	7.82998	0	0	0	0
10.78752	7.82998	0	0	0	0
10.78752	6.569978	0	0	0	0
10.09752	6.569978	0	0	0	0
10.09752	7.82998	0	0	0	0
9.347524	7.82998	0	0	0	0
9.467526	7.82998	0	0	0	0
9.587524	7.82998	0	0	0	0
9.707524	7.82998	0	0	0	0
9.827524	7.82998	0	0	0	0
9.947523	7.82998	0	0	0	0
10.06752	7.82998	0	0	0	0
10.18752	7.82998	0	0	0	0
10.30753	7.82998	0	0	0	0
10.42753	7.82998	0	0	0	0
10.54752	7.82998	0	0	0	0
10.66752	7.82998	0	0	0	0
10.09752	6.684524	0	0	0	0
10.09752	6.799068	0	0	0	0
10.09752	6.913616	0	0	0	0
10.09752	7.028159	0	0	0	0
10.09752	7.142705	0	0	0	0
10.09752	7.257253	0	0	0	0
10.09752	7.371796	0	0	0	0
10.09752	7.486345	0	0	0	0
10.09752	7.600889	0	0	0	0
10.09752	7.715436	0	0	0	0
10.78752	6.684524	0	0	0	0
10.78752	6.799068	0	0	0	0
10.78752	6.913616	0	0	0	0
10.78752	7.028159	0	0	0	0
10.78752	7.142705	0	0	0	0
10.78752	7.257253	0	0	0	0
10.78752	7.371796	0	0	0	0
10.78752	7.486345	0	0	0	0
10.78752	7.600889	0	0	0	0
10.78752	7.715436	0	0	0	0

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9.227525   6.913616   0   0   0   0
9.227525   7.028159   0   0   0   0
9.227525   7.142705   0   0   0   0
9.227525   7.257253   0   0   0   0
9.227525   7.371796   0   0   0   0
9.227525   7.486345   0   0   0   0
9.227525   7.600889   0   0   0   0
9.227525   7.715436   0   0   0   0
9.347524   6.569978   0   0   0   0
9.467526   6.569978   0   0   0   0
9.587524   6.569978   0   0   0   0
9.707524   6.569978   0   0   0   0
9.827524   6.569978   0   0   0   0
9.947523   6.569978   0   0   0   0
10.06752   6.569978   0   0   0   0
10.18752   6.569978   0   0   0   0
10.30753   6.569978   0   0   0   0
10.42753   6.569978   0   0   0   0
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10.66752   6.569978   0   0   0   0
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5.340015   5.615999   0   0   0   0
```

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11.60001  5.219985  0  0  0  0
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11.26001  6.679985 -.2  0  0  0
```

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11.48001  7.919986 -.2  0  0  0
7.920013  6.999986 -.2  0  0  0
7.880013  6.999986 -.2  0  0  0
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6.320011  2.292805  0  0  0  0
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6.320011  1.509986 -.2  0  0  0
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10.88001  6.238663  0  0  0  0
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10.89  8.000004  0  0  0  0
3  372  3  0  0  0  0  0
```

```
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8   375   3   0   0   0   0   0
10   374   3   0   0   0   0   0
11   377   3   0   0   0   0   0
1   416   3   0   0   0   0   0
15   371   3   0   0   0   0   0
15   3   3   0   0   0   0   0
21   15   3   0   0   0   0   0
179   178   3   0   0   0   0   0
174   179   3   0   0   0   0   0
182   367   3   0   0   0   0   0
195   191   6   0   0   0   0   0
194   192   6   0   0   0   0   0
193   451   6   0   0   0   0   0
196   195   6   0   0   0   0   0
197   448   6   0   0   0   0   0
198   194   6   0   0   0   0   0
201   200   3   0   0   0   0   0
202   203   3   0   0   0   0   0
205   204   3   0   0   0   0   0
206   207   3   0   0   0   0   0
209   208   3   0   0   0   0   0
211   224   12   0   0   0   0   0
211   228   12   0   0   0   0   0
213   232   12   0   0   0   0   0
214   256   12   0   0   0   0   0
214   266   12   0   0   0   0   0
215   280   12   0   0   0   0   0
216   284   12   0   0   0   0   0
217   220   12   0   0   0   0   0
219   246   12   0   0   0   0   0
221   222   12   0   0   0   0   0
223   210   12   0   0   0   0   0
225   226   12   0   0   0   0   0
227   210   12   0   0   0   0   0
229   230   12   0   0   0   0   0
231   212   12   0   0   0   0   0
233   234   12   0   0   0   0   0
235   236   12   0   0   0   0   0
237   238   12   0   0   0   0   0
239   240   12   0   0   0   0   0
241   242   12   0   0   0   0   0
243   244   12   0   0   0   0   0
245   212   12   0   0   0   0   0
247   248   12   0   0   0   0   0
249   250   12   0   0   0   0   0
251   252   12   0   0   0   0   0
253   254   12   0   0   0   0   0
```

255	218	12	0	0	0	0	0
257	258	12	0	0	0	0	0
259	260	12	0	0	0	0	0
261	262	12	0	0	0	0	0
263	264	12	0	0	0	0	0
265	213	12	0	0	0	0	0
267	268	12	0	0	0	0	0
269	270	12	0	0	0	0	0
271	272	12	0	0	0	0	0
273	274	12	0	0	0	0	0
275	276	12	0	0	0	0	0
277	278	12	0	0	0	0	0
279	215	12	0	0	0	0	0
281	282	12	0	0	0	0	0
283	216	12	0	0	0	0	0
285	286	12	0	0	0	0	0
287	217	12	0	0	0	0	0
292	293	3	0	0	0	0	0
294	295	3	0	0	0	0	0
297	296	3	0	0	0	0	0
300	301	3	0	0	0	0	0
303	302	3	0	0	0	0	0
304	342	12	0	0	0	0	0
305	310	12	0	0	0	0	0
307	332	12	0	0	0	0	0
304	352	12	0	0	0	0	0
308	322	12	0	0	0	0	0
311	312	12	0	0	0	0	0
313	314	12	0	0	0	0	0
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316	317	12	0	0	0	0	0
317	318	12	0	0	0	0	0
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325	326	12	0	0	0	0	0
327	328	12	0	0	0	0	0
329	330	12	0	0	0	0	0
331	309	12	0	0	0	0	0
333	334	12	0	0	0	0	0
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337	338	12	0	0	0	0	0
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345	346	12	0	0	0	0	0
347	348	12	0	0	0	0	0
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351	305	12	0	0	0	0	0

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357	358	12	0	0	0	0	0
358	359	12	0	0	0	0	0
360	361	12	0	0	0	0	0
362	363	12	0	0	0	0	0
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364	174	3	0	0	0	0	0
366	365	3	0	0	0	0	0
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379	380	3	0	0	0	0	0
380	383	3	0	0	0	0	0
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386	385	3	0	0	0	0	0
386	389	3	0	0	0	0	0
387	388	3	0	0	0	0	0
385	390	3	0	0	0	0	0
392	393	6	0	0	0	0	0
61	13	6	0	0	0	0	0
400	401	3	0	0	0	0	0
417	401	3	0	0	0	0	0
418	417	3	0	0	0	0	0
420	418	3	0	0	0	0	0
419	404	3	0	0	0	0	0
425	426	3	0	0	0	0	0
427	426	3	0	0	0	0	0
428	427	3	0	0	0	0	0
429	430	3	0	0	0	0	0
430	431	3	0	0	0	0	0
432	431	3	0	0	0	0	0
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440	441	4	0	0	0	0	0
443	442	4	0	0	0	0	0
444	445	4	0	0	0	0	0
447	446	3	0	0	0	0	0
449	199	6	0	0	0	0	0
450	190	6	0	0	0	0	0
453	452	3	0	0	0	0	0
454	61	6	0	0	0	0	0
456	455	3	0	0	0	0	0
187	463	4	0	0	0	0	0
463	464	4	0	0	0	0	0
188	464	4	0	0	0	0	0
187	188	4	0	0	0	0	0
435	466	3	0	0	0	0	0
467	466	3	0	0	0	0	0
468	467	3	0	0	0	0	0

```
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6.137511  4.602803  0
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6.829633  7.199973  0  6  0  .2445484  0  0  0  0  0
11.32003  7.199973  0
6.829633  11.69038  0
6.829633  7.199973  0  6  6.039507  0  0  0  0  0  0
```

```
11.32003  7.199973  0
6.829633  11.69038  0
7.124021  5.615984  0  3  0  1.570796  0  0  0  0  0
7.22002  5.615984  0
7.124021  5.711982  0
7.036016  5.615997  0  3  1.570796  3.141592  0  0  0  0  0
7.132017  5.615997  0
7.036016  5.711998  0
5.15602  5.615984  4.768372E-08  3  0  1.570796  0  0  0  0  0
5.06002  5.615984  0
5.15602  5.711982  4.768372E-08
5.244016  5.615999 -4.768376E-08  3  1.570796  3.141592  0  0  0  0  0
5.148016  5.615999 -7.152561E-08
5.244016  5.711998 -4.768376E-08
10.41252  7.207475  0  3  2.528041  3.141592  0  0  0  0  0
10.41253  6.24748  0
11.23752  7.207479  0
10.41252  7.207475  0  3  .8448392  2.268768  0  0  0  0  0
10.41253  6.24748  0
11.23752  7.207479  0
11.04003  5.559982  0  3  3.141592  4.712412  0  0  0  0  0
11.20003  5.559982  0
11.04003  5.719983  0
11.01003  5.499979  0  4  0  0  0  0  0  0  0
11.07003  5.499979  0
11.01003  5.559979  0
11.01003  5.499979  0  4  0  0  0  0  0  0  0
11.04003  5.499979  0
11.01003  5.529979  0
11.48001  7.819986 -.2  4  0  0  0  0  0  0  0
11.58001  7.819986 -.2
11.48001  7.919986 -.2
11.48001  6.579985 -.2  4  0  0  0  0  0  0  0
11.58001  6.579985 -.2
11.48001  6.679985 -.2
8.89003  7.199978  0  3  1.382262  1.759318  0  0  0  0  0
8.89003  8.27998  0
7.870026  7.199978  0
8.89003  7.199978  0  6  1.759318  3.141592  0  0  0  0  0
8.89003  8.27998  0
7.870026  7.199978  0
9.010025  7.199978  0  16  1.382262  1.759318  0  0  0  0  0
9.010025  8.27998  0
7.990026  7.199978  0
9.010025  7.199978  0  6  1.759318  3.141592  0  0  0  0  0
9.010025  8.27998  0
7.990026  7.199978  0
5.200015  5.639995  0  4  0  0  0  0  0  0  0
5.260015  5.639995  0
```

```
5.200015  5.699997  0
5.200015  5.619995  0  4  0  0  0  0  0  0  0
5.230015  5.619995  0
5.200015  5.649995  0
7.080015  5.619995  0  4  0  0  0  0  0  0  0
7.110015  5.619995  0
7.080015  5.649995  0
7.080015  5.639995  0  4  0  0  0  0  0  0  0
7.140016  5.639995  0
7.080015  5.699997  0
11.00311  8.162851  0  3  1.594229  3.167698  0  0  0  0  0
11.12311  8.162851  0
11.00311  8.282852  0
11.00436  8.115086  0  3 -3.115486 -1.547881  0  0  0  0  0
11.12436  8.115086  0
11.00436  8.235086  0
11.00001  6.279999  0  3  1.570796  3.141592  0  0  0  0  0
11.12001  6.279999  0
11.00001  6.399999  0
11.00001  6.238663  0  3  3.141592  4.70119  0  0  0  0  0
11.12001  6.238663  0
11.00001  6.358663  0
10.94002  8.139998  0  4  0  0  0  0  0  0  0
10.94002  8.059998  0
10.97202  8.139998  0
10.97202  8.139998  0  4  3.785093  5.639682  0  0  0  0  0
10.97202  8.044998  0
11.01002  8.139998  0
10.94002  6.259998  0  4  0  0  0  0  0  0  0
10.94002  6.179998  0
10.97202  6.259998  0
10.97202  6.259998  0  4  3.785093  5.639682  0  0  0  0  0
10.97202  6.164998  0
11.01002  6.259998  0
0  0  0  0  0
```

Data File SS2V119.DIM: Dimensions File for the Single-Place Encapsulated Seat

```
"2.00","ss3v119.CAD","IN",1,0,0
 1  192  197  1  1 -.657  .037  0  0  0  0  0  0  0
.15,.129,0,2,3,0,0,"65"
 2  432  289  1  1  3.42  1.5  0  0  0  0  0  0  0
.15,.129,0,2,3,0,0,"60"
 1  288  289  1  1  .78  2.13  0  0  0  0  0  0  0
.15,.129,0,2,3,0,0,"36"
```

Data File SEATXL.CAD: Subsystems Location File for the Single-Place Encapsulated Seat

```
"2.00","","IN",1,0,0
 247  146  29  0  1  0  0  0  0  0  0  0  0  0  0
 9.437512  8.195282  2.980232E-08  0  0  0
 9.437512  4.995285  2.980232E-08  0  0  0
 6.237516  4.995285  2.980232E-08  0  0  0
 7.837513  7.745566 -2.980232E-08  0  0  0
 9.387523  5.195565  0  0  0  0
 6.637513  6.545566  0  0  0  0
 9.287513  5.095568  0  0  0  0
 7.787523  7.695566  0  0  0  0
 9.337524  5.145566  2.980232E-08  0  0  0
 6.687513  6.595567  0  0  0  0
 6.237518  5.045566  0  0  0  0
 9.237513  5.045566 -2.980232E-08  0  0  0
 10.93752  8.195293  0  0  0  0
 9.287513  4.895291  0  0  0  0
 6.237516  4.895291  2.980232E-08  0  0  0
 6.337503  4.894993  0  0  0  0
 5.587503  2.894991  0  0  0  0
 5.487501  2.894991  2.980232E-08  0  0  0
 5.287502  1.994992  0  0  0  0
 5.437499  1.944991  0  0  0  0
 5.36251  2.744994  0  0  0  0
 5.487509  2.744994  0  0  0  0
 5.587508  2.994996  0  0  0  0
 5.537507  2.869994  0  0  0  0
 7.437513  2.869994 -2.980232E-08  0  0  0
 7.562512  4.644995  0  0  0  0
 7.562512  4.594994  0  0  0  0
 9.012513  4.419993  0  0  0  0
 10.03751  8.094992  0  0  0  0
 9.9375  8.094992  0  0  0  0
 8.937503  4.644994 -5.960465E-08  0  0  0
 7.587513  4.794992 -2.980232E-08  0  0  0
 8.812503  4.544992  2.980232E-08  0  0  0
 7.512503  4.769994  0  0  0  0
 7.487503  4.719994  0  0  0  0
 7.512503  4.644994  0  0  0  0
 6.487505  2.869993 -2.980232E-08  0  0  0
 6.962503  4.569994 -2.980232E-08  0  0  0
 6.837503  4.619995  0  0  0  0
 6.887503  5.119995  2.980232E-08  0  0  0
 6.862503  5.169994  0  0  0  0
 6.812503  5.169994 -2.980232E-08  0  0  0
 6.787503  5.119995  0  0  0  0
 6.737503  4.669994  0  0  0  0
 7.662503  4.544992  0  0  0  0
 8.862503  4.369993  0  0  0  0
```

```
8.862503  3.844993  0  0  0  0
7.662503  3.844993  0  0  0  0
9.212503  4.694993 -2.980232E-08  0  0  0
9.6125  6.119992 -2.980232E-08  0  0  0
10.23751  5.969993  0  0  0  0
9.6125  4.694993 -2.980232E-08  0  0  0
8.012503  2.769991 -2.980232E-08  0  0  0
7.162503  2.269991  0  0  0  0
6.937503  2.544993  0  0  0  0
5.846501  1.976489  0  0  0  0
9.53751  4.544992  0  0  0  0
10.16251  8.194992  0  0  0  0
9.78751  6.819992  0  0  0  0
10.36251  6.644991  0  0  0  0
10.71251  8.194992  0  0  0  0
9.7125  6.54499  0  0  0  0
9.6125  6.269993 -2.980232E-08  0  0  0
9.9375  6.144991  0  0  0  0
10.0625  6.494991  0  0  0  0
10.1625  8.019993  0  0  0  0
9.9875  7.394993  0  0  0  0
10.4625  7.294991 -5.960465E-08  0  0  0
10.6125  7.919992  0  0  0  0
10.3875  7.969992  0  0  0  0
10.2375  7.344992  5.960465E-08  0  0  0
10.05536  7.380707  0  0  0  0
10.12322  7.366417  0  0  0  0
10.19108  7.352133  0  0  0  0
10.25893  7.337847  0  0  0  0
10.32679  7.323563  0  0  0  0
10.39464  7.309276  0  0  0  0
10.25416  7.414434  0  0  0  0
10.27083  7.483877  0  0  0  0
10.2875  7.553322  5.960465E-08  0  0  0
10.30417  7.622766  0  0  0  0
10.32084  7.692211  0  0  0  0
10.3375  7.761658  5.960465E-08  0  0  0
10.35417  7.831101  5.960465E-08  0  0  0
10.37084  7.900547  0  0  0  0
10.00695  7.464436  0  0  0  0
10.02639  7.533882  0  0  0  0
10.04584  7.603321  0  0  0  0
10.06528  7.67277  0  0  0  0
10.08473  7.742212  5.960465E-08  0  0  0
10.10417  7.811657 -5.960465E-08  0  0  0
10.12362  7.881103 -5.960465E-08  0  0  0
10.14306  7.950546  0  0  0  0
10.47917  7.364437  0  0  0  0
10.49584  7.433876  0  0  0  0
```

```
10.5125  7.503324 -5.960465E-08  0  0  0
10.52917  7.572767 -5.960465E-08  0  0  0
10.54584  7.642212  0  0  0  0
10.5625  7.711657  0  0  0  0
10.57917  7.781101  0  0  0  0
10.59583  7.850549  0  0  0  0
6.312499  2.09499  0  0  0  0
6.912503  2.09499  0  0  0  0
6.912503  2.69499  0  0  0  0
6.312499  2.69499  0  0  0  0
6.012502  2.44499  0  0  0  0
6.312499  2.44499  0  0  0  0
6.312499  2.34499  0  0  0  0
6.012502  2.34499  0  0  0  0
6.1455  2.242994  0  0  0  0
5.7  2.242994  0  0  0  0
5.7  1.999995  0  0  0  0
6.1455  1.999995  0  0  0  0
6.1455  2.080994  0  0  0  0
6.3885  2.080994 -2.980232E-08  0  0  0
6.3885  2.323993 -2.980232E-08  0  0  0
6.3075  2.323993  0  0  0  0
6.3075  2.161993  0  0  0  0
6.1455  2.161993  0  0  0  0
5.862002  2.242994  0  0  0  0
5.862002  2.323993  0  0  0  0
5.781  2.323993  0  0  0  0
5.781  2.242994  0  0  0  0
7.605203  2.056296  0  0  0  0
8.348343  2.725427  0  0  0  0
7.872853  1.759037  0  0  0  0
8.616003  2.428169  0  0  0  0
9.8512  4.302298  0  0  0  0
9.182073  3.559153  0  0  0  0
10.14846  4.034644  0  0  0  0
9.479333  3.291501 -2.980232E-08  0  0  0
9.047854  2.718217  0  0  0  0
9.189282  2.85964  0  0  0  0
9.472123  2.718218  0  0  0  0
9.189282  2.435377  0  0  0  0
9.056693  3.062933  0  0  0  0
9.189282  3.283904  0  0  0  0
9.268833  3.239709 -2.980232E-08  0  0  0
9.136243  3.01874  0  0  0  0
8.888763  2.771251  0  0  0  0
8.667793  2.638669 -2.980232E-08  0  0  0
8.623594  2.718217  2.980232E-08  0  0  0
8.835723  2.841962  0  0  0  0
8.561723  2.355827  0  0  0  0
```

```
8.694303  2.453054  0  0  0  0
8.747343  2.382343  0  0  0  0
8.614753  2.285115  0  0  0  0
8.729663  2.400021 -2.980232E-08  0  0  0
9.092053  2.620991 -2.980232E-08  0  0  0
9.083213  2.647508  0  0  0  0
8.720823  2.426537  0  0  0  0
9.55167  3.345776  0  0  0  0
9.454443  3.213193  0  0  0  0
9.52515  3.160159  0  0  0  0
9.62238  3.292742  0  0  0  0
9.50747  3.177837 -2.980232E-08  0  0  0
9.286503  2.815445 -2.980232E-08  0  0  0
9.259993  2.824284  0  0  0  0
9.480963  3.186676  2.980232E-08  0  0  0
8.473332  2.267436 -2.980232E-08  0  0  0
8.756173  2.514924  0  0  0  0
8.844563  2.39118  0  0  0  0
8.561723  2.143693 -2.980232E-08  0  0  0
8.818043  2.435374  0  0  0  0
9.065533  2.682862  0  0  0  0
8.791534  2.461891  0  0  0  0
9.392572  3.151321  5.960465E-08  0  0  0
9.64006  3.434164  0  0  0  0
9.7638  3.345776  0  0  0  0
9.51631  3.062933  0  0  0  0
9.445602  3.115965 -2.980232E-08  0  0  0
9.224633  2.841961  0  0  0  0
9.472123  3.089449 -2.980232E-08  0  0  0
6.612503  1.569996  0  0  0  0
6.712503  1.669995  0  0  0  0
7.837503  1.669995  0  0  0  0
9.012503  2.344996  2.980232E-08  0  0  0
9.012503  2.244995  2.980232E-08  0  0  0
7.837503  1.569996  0  0  0  0
10.3625  5.444996  0  0  0  0
10.3625  4.169994  0  0  0  0
9.6875  2.919994  5.960465E-08  0  0  0
9.5875  2.919994 -2.980232E-08  0  0  0
10.2625  4.169995  0  0  0  0
10.2625  5.269997  0  0  0  0
10.5125  5.744996 -5.960465E-08  0  0  0
9.5125  1.444996  0  0  0  0
9.91251  1.344996 -5.960465E-08  0  0  0
10.8625  5.644998  5.960465E-08  0  0  0
10.82  8.189998  0  0  0  0
10.82  8.429997  0  0  0  0
10.26  8.429997  0  0  0  0
10.2  8.249997  0  0  0  0
```

```
10.46  7.989998  0  0  0  0
10.8  7.989998  0  0  0  0
10.2  8.249997  0  0  0  0
10.46  8.339997  0  0  0  0
10.43  8.259996  0  0  0  0
10.62  8.279997  0  0  0  0
10.62  8.349997  0  0  0  0
10.82  8.359997  0  0  0  0
10.95  7.449996  0  0  0  0
11.3  7.299995  0  0  0  0
7.600004  3.749997  0  0  0  0
7.650004  3.099997  0  0  0  0
8.300003  3.099997  0  0  0  0
8.300003  3.749997  0  0  0  0
6.700001  3.649997  0  0  0  0
5.900002  3.799997  0  0  0  0
.5  .5  0  0  0  0
3.5  .5  0  0  0  0
4  8.499998  0  0  0  0
7.3  7.499998  0  0  0  0
6.8  6.999999  0  0  0  0
3.500001  7.299998  0  0  0  0
3.500001  6.099999  0  0  0  0
6.100001  4.999999  0  0  0  0
6.6  4.499999  0  0  0  0
3.500001  5.199999  0  0  0  0
3.500001  4.199999  0  0  0  0
6.300001  4  0  0  0  0
6.100001  3.299999  0  0  0  0
4.100001  3.499999  0  0  0  0
3.900001  2.299999  0  0  0  0
5.800001  2.499999  0  0  0  0
4.700001  2.699999  0  0  0  0
3.700001  1.499999  0  0  0  0
5.700001  1.599999  0  0  0  0
8.900002  8.9  0  0  0  0
9.800001  8.400001  0  0  0  0
10.7  8.500001  0  0  0  0
11.7  8.900003  0  0  0  0
11.7  8.000003  0  0  0  0
11.7  7.100003  0  0  0  0
10.20001  7.100003  0  0  0  0
11.70001  6.300003  0  0  0  0
9.900009  6.500002  0  0  0  0
11.70001  5.300003  0  0  0  0
9.10001  4.600002  0  0  0  0
11.70001  4.200003  0  0  0  0
8.400007  4.100003  0  0  0  0
8.100006  3.500003  0  0  0  0
```

```
11.7  3.500003  0  0  0  0
11.7  2.600003  0  0  0  0
9.300003  2.600003  0  0  0  0
9.800005  1.800003  0  0  0  0
11.7  1.500003  0  0  0  0
2  1  3  0  0  0  0  0
3  2  3  0  0  0  0  0
4  5  3  0  0  0  0  0
6  7  3  0  0  0  0  0
8  9  3  0  0  0  0  0
10  9  3  0  0  0  0  0
11  12  3  0  0  0  0  0
1  13  3  0  0  0  0  0
15  14  3  0  0  0  0  0
15  3  3  0  0  0  0  0
21  15  3  0  0  0  0  0
22  16  3  0  0  0  0  0
22  23  3  0  0  0  0  0
24  25  2  0  0  0  0  0
25  26  2  0  0  0  0  0
26  28  2  0  0  0  0  0
28  29  2  0  0  0  0  0
30  29  2  0  0  0  0  0
31  30  2  0  0  0  0  0
32  33  2  0  0  0  0  0
34  32  2  0  0  0  0  0
35  34  2  0  0  0  0  0
35  36  2  0  0  0  0  0
36  26  2  0  0  0  0  0
37  38  2  0  0  0  0  0
16  38  2  0  0  0  0  0
39  40  2  0  0  0  0  0
41  40  2  0  0  0  0  0
42  41  2  0  0  0  0  0
43  42  2  0  0  0  0  0
44  43  2  0  0  0  0  0
45  46  5  0  0  0  0  0
47  46  5  0  0  0  0  0
48  47  5  0  0  0  0  0
48  45  5  0  0  0  0  0
59  58  5  0  0  0  0  0
59  60  5  0  0  0  0  0
60  61  5  0  0  0  0  0
63  62  5  0  0  0  0  0
63  64  5  0  0  0  0  0
64  65  5  0  0  0  0  0
67  86  2  0  0  0  0  0
67  72  2  0  0  0  0  0
68  94  2  0  0  0  0  0
```

71	78	2	0	0	0	0	0
73	74	2	0	0	0	0	0
74	75	2	0	0	0	0	0
75	76	2	0	0	0	0	0
77	68	2	0	0	0	0	0
79	80	2	0	0	0	0	0
81	82	2	0	0	0	0	0
83	84	2	0	0	0	0	0
85	70	2	0	0	0	0	0
86	87	2	0	0	0	0	0
88	89	2	0	0	0	0	0
89	90	2	0	0	0	0	0
91	92	2	0	0	0	0	0
93	66	2	0	0	0	0	0
95	96	2	0	0	0	0	0
96	97	2	0	0	0	0	0
98	99	2	0	0	0	0	0
99	100	2	0	0	0	0	0
101	69	2	0	0	0	0	0
111	110	5	0	0	0	0	0
112	111	5	0	0	0	0	0
112	113	5	0	0	0	0	0
113	110	5	0	0	0	0	0
114	115	5	0	0	0	0	0
115	116	5	0	0	0	0	0
118	117	5	0	0	0	0	0
119	118	5	0	0	0	0	0
120	121	5	0	0	0	0	0
123	122	5	0	0	0	0	0
124	125	4	0	0	0	0	0
126	127	4	0	0	0	0	0
129	128	4	0	0	0	0	0
131	130	4	0	0	0	0	0
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132	135	4	0	0	0	0	0
136	137	4	0	0	0	0	0
139	138	4	0	0	0	0	0
141	140	4	0	0	0	0	0
142	143	4	0	0	0	0	0
160	161	4	0	0	0	0	0
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160	163	4	0	0	0	0	0
164	150	4	0	0	0	0	0
166	165	4	0	0	0	0	0
167	168	4	0	0	0	0	0

168	169	4	0	0	0	0	0
170	169	4	0	0	0	0	0
167	170	4	0	0	0	0	0
172	171	4	0	0	0	0	0
158	173	4	0	0	0	0	0
174	175	3	0	0	0	0	0
175	176	3	0	0	0	0	0
176	177	3	0	0	0	0	0
178	177	3	0	0	0	0	0
179	178	3	0	0	0	0	0
174	179	3	0	0	0	0	0
181	180	3	0	0	0	0	0
182	181	3	0	0	0	0	0
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184	185	3	0	0	0	0	0
185	180	3	0	0	0	0	0
187	188	4	0	0	0	0	0
190	191	3	0	0	0	0	0
192	191	3	0	0	0	0	0
193	192	3	0	0	0	0	0
196	193	3	0	0	0	0	0
194	195	3	0	0	0	0	0
192	197	4	0	0	0	0	0
193	198	4	0	0	0	0	0
199	190	4	0	0	0	0	0
200	201	4	0	0	0	0	0
187	202	4	0	0	0	0	0
202	203	4	0	0	0	0	0
188	203	4	0	0	0	0	0
205	206	5	0	0	0	0	0
206	207	5	0	0	0	0	0
204	207	5	0	0	0	0	0
204	205	5	0	0	0	0	0
209	208	2	0	0	0	0	0
212	213	7	0	0	0	0	0
215	214	7	0	0	0	0	0
216	217	7	0	0	0	0	0
219	218	7	0	0	0	0	0
220	221	7	0	0	0	0	0
223	222	7	0	0	0	0	0
226	225	7	0	0	0	0	0
227	228	7	0	0	0	0	0
229	230	7	0	0	0	0	0
231	232	7	0	0	0	0	0
83	233	7	0	0	0	0	0
235	234	7	0	0	0	0	0
237	236	7	0	0	0	0	0
239	238	7	0	0	0	0	0

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241  240  7  0  0  0  0  0
242  243  7  0  0  0  0  0
245  244  7  0  0  0  0  0
246  247  7  0  0  0  0  0
9.437512  4.995282  2.980232E-08  1  1.570796  2.380054  0  0  0  0  0
12.63752  4.995282  0
9.437512  8.195282  2.980232E-08
9.437512  4.995285  2.980232E-08  3  0  0  0  0  0  0  0
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9.437512  5.195283  2.980232E-08
3.437513  8.495281  0  3  5.115503  6.242666  0  0  0  0  0
10.83008  8.495281  5.960465E-08
3.437513  15.88784  0
3.437517  8.395292  0  6  5.110262  6.256524  0  0  0  0  0
10.92217  8.395292  0
3.437517  15.87995  0
6.073266  2.292599  0  6  2.574772  5.112052  0  0  0  0  0
6.913503  2.292599  0
6.073266  3.132835  0
6.087501  2.394993  0  13  2.613512  5.05542  0  0  0  0  0
6.794603  2.394993  0
6.087501  3.1021  0
8.912503  4.544992 -2.980232E-08  6  0  0  0  0  0  0  0
9.012513  4.544992  0
8.912503  4.644995 -2.980232E-08
9.88751  6.519991  0  5  0  0  0  0  0  0  0
10.0625  6.519991  0
9.88751  6.694992  0
10.33751  7.969992  5.960465E-08  14  0  0  0  0  0  0  0
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10.33751  8.069992  5.960465E-08
10.33751  7.969992  5.960465E-08  14  0  0  0  0  0  0  0
10.51251  7.969992 -5.960465E-08
10.33751  8.144993  5.960465E-08
10.2725  7.999992  5.960465E-08  2  6.059707  2.918115  0  0  0  0  0
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10.2725  8.112797  5.960465E-08
10.5025  7.944992  0  2  6.059707  2.927534  0  0  0  0  0
10.6153  7.944992 -5.960465E-08
10.5025  8.057797  0
5.8215  2.526493  2.980232E-08  5  0  0  0  0  0  0  0
6.024  2.526493  0
5.8215  2.728993  2.980232E-08
6.348  2.526493  0  5  0  0  0  0  0  0  0
6.5505  2.526493 -2.980232E-08
6.348  2.728993  0
8.482173  2.576798  0  4  4.712388  1.570796  0  0  0  0  0
8.630803  2.710622 -2.980232E-08
8.348343  2.725427  0
```

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7.739023  1.907667  0  4  1.570796  4.712388  0  0  0  0  0
7.887652  2.041493  0
7.605203  2.056296  0
9.330703  3.425326 -2.980232E-08  4  4.712388  1.570796  0  0  0  0  0
9.196873  3.276696  0
9.182073  3.559153  0
9.99983  4.168471  5.960465E-08  4  1.570796  4.712388  0  0  0  0  0
9.866  4.019842 -5.960465E-08
9.8512  4.302298  0
9.012503  2.894995  2.980232E-08  4  5.30039  4.124386  0  0  0  0  0
9.139983  3.022471  2.980232E-08
8.885023  3.022472  0
6.087501  2.364994  0  3  2.553589  5.069522  0  0  0  0  0
6.808613  2.364994  0
6.087501  3.086104  0
9.437512  4.995282  2.980232E-08  2  2.380054  2.593831  0  0  0  0  0
12.63752  4.995282  0
9.437512  8.195282  2.980232E-08
9.437512  4.995282  2.980232E-08  1  2.593831  3.141592  0  0  0  0  0
12.63752  4.995282  0
9.437512  8.195282  2.980232E-08
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6.912503  7.267503  0
10.46  8.249997  0  3  3.141592  4.712388  0  0  0  0  0
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10.46  8.509997  0
10.47  8.089997  0  4  0  0  0  0  0  0  0
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10.47  8.169998  0
10.47  8.089997  0  4  0  0  0  0  0  0  0
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10.47  8.119998  0
10.48  8.289996  0  4  3.785093  2.034443  0  0  0  0  0
10.53  8.289996  0
10.48  8.339996  0
10.59  8.309997  0  4  1.107149  5.30039  0  0  0  0  0
10.63472  8.309997  0
10.59  8.354718  0
6.650004  4.4  0  5  0  0  0  0  0  0  0  0
6.850005  4.4  0
6.650004  4.6  0
```

Data File SEATXN.NOT: Subsystems Note File for the Single-Place Encapsulated Seat

```
"2.00","seatxl.CAD","IN",1,0,0
 1 -8.637512  .804718  .15  .129  7  0  4 -3  0  0  0  0  0
"FABRIC DOOR _ NICALON THERMAL BLANKET

 1 -6.937512 -.8952823  .15  .129  7  0  4 -3  0  0  0  0  0
"WINDOW

 1 -6.937512 -1.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"PRESSURE SEAL

 1 -6.937512 -2.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"DOOR REELS (2)

 1 -6.937512 -3.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"INSTRUMENTS

 1 -6.937512 -4.595283  .15  .129  7  0  4 -3  0  0  0  0  0
"CONTROLLER/POWER SUPPLY

 1 -6.937512 -5.495283  .15  .129  7  0  4 -3  0  0  0  0  0
"ATTITUDE CONTROL

 1 -8.637512 -6.495283  .15  .129  7  0  4 -3  0  0  0  0  0
"RCC HEAT SHIELD / OUTER SHELL

 1 -1.637512  .8047142  .15  .129  7  0  4 -3  0  0  0  0  0
"STOWED DOOR POSITION

 1  2.362488 -.1952858  .15  .129  7  0  4 -3  0  0  0  0  0
"TRACTOR ROCKETS (2)

 1  2.362488 -.995286  .15  .129  7  0  4 -3  0  0  0  0  0
"MAIN AND DROGUE

 1  2.362488 -1.995286  .15  .129  7  0  4 -3  0  0  0  0  0
"INERTIAL REEL

 1  2.362488 -3.995286  .15  .129  7  0  4 -3  0  0  0  0  0
"SURVIVAL KIT

 1  2.362488 -4.795286  .15  .129  7  0  4 -3  0  0  0  0  0
"LIFE SUPPORT SYSTEM

 1  2.362488 -5.595286  .15  .129  7  0  4 -3  0  0  0  0  0
"ROCKET PROPULSION SYSTEM
```

```
 1  2.362488 -6.795286  .15  .129  7  0  4 -3  0  0  0  0  0
"CATAPULT TUBES (2)

 1  2.362488 -2.995286  .15  .129  7  0  4 -3  0  0  0  0  0
"SEAT

 1  2.362487  .804718  .15  .129  7  0  4 -3  0  0  0  0  0
"ATTITUDE CONTROL
THRUSTERS(6)
",0
```

Data File DS3V.CAD: Three-View File for the Dual-Place Encapsulated Seat

```
"2.00","","IN",1,0,0
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 6.062495  4.949987  0  0  0  0
 4.262497  4.949987  0  0  0  0
 4.862495  2.224987  0  0  0  0
 4.262497  2.824986  0  0  0  0
 6.062495  2.824986  0  0  0  0
 6.062495  2.174989  0  0  0  0
 4.862495  1.574986  0  0  0  0
 4.262497  2.174988  0  0  0  0
 5.462494  1.574986  0  0  0  0
 6.062497  3.299987  0  0  0  0
 4.262497  3.299987  0  0  0  0
 4.262497  3.349987  0  0  0  0
 6.062497  3.349987  0  0  0  0
 5.962497  4.312489  0  0  0  0
 5.962497  3.349987  0  0  0  0
 4.362495  3.349987  0  0  0  0
 4.362495  4.312489  0  0  0  0
 5.962497  3.374989  0  0  0  0
 4.362495  3.374989  0  0  0  0
 5.387494  4.887486  0  0  0  0
 5.387494  4.512487  0  0  0  0
 5.687497  4.262486  0  0  0  0
 5.687497  3.062487  0  0  0  0
 4.637497  3.062487  0  0  0  0
 4.637497  4.262486  0  0  0  0
 4.937497  4.512486  0  0  0  0
 4.937497  4.887486  0  0  0  0
 5.687497  3.237485  0  0  0  0
 4.637497  3.237485  0  0  0  0
 5.027494  4.887486  0  0  0  0
 5.117496  4.887486  0  0  0  0
 5.207497  4.887486  0  0  0  0
 5.297495  4.887486  0  0  0  0
 5.387494  4.587489  0  0  0  0
 5.387494  4.662487  0  0  0  0
 5.387494  4.737485  0  0  0  0
 5.387494  4.812489  0  0  0  0
 5.447496  4.462488  0  0  0  0
 5.507495  4.412487  0  0  0  0
 5.567498  4.362485  0  0  0  0
 5.627497  4.312489  0  0  0  0
 5.687497  3.142487  0  0  0  0
 5.687497  3.222486  0  0  0  0
 5.687497  3.302485  0  0  0  0
 5.687497  3.382486  0  0  0  0
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5.687497	3.542487	0	0	0	0
5.687497	3.622487	0	0	0	0
5.687497	3.702486	0	0	0	0
5.687497	3.782485	0	0	0	0
5.687497	3.862487	0	0	0	0
5.687497	3.942489	0	0	0	0
5.687497	4.022488	0	0	0	0
5.687497	4.102488	0	0	0	0
5.687497	4.182486	0	0	0	0
4.732951	3.237485	0	0	0	0
4.828404	3.237485	0	0	0	0
4.923861	3.237485	0	0	0	0
5.019316	3.237485	0	0	0	0
5.114768	3.237485	0	0	0	0
5.210225	3.237485	0	0	0	0
5.305679	3.237485	0	0	0	0
5.401133	3.237485	0	0	0	0
5.496589	3.237485	0	0	0	0
5.592042	3.237485	0	0	0	0
4.732951	3.062487	0	0	0	0
4.828404	3.062487	0	0	0	0
4.923861	3.062487	0	0	0	0
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5.114768	3.062487	0	0	0	0
5.210225	3.062487	0	0	0	0
5.305679	3.062487	0	0	0	0
5.401133	3.062487	0	0	0	0
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5.592042	3.062487	0	0	0	0
4.637497	3.142487	0	0	0	0
4.637497	3.222486	0	0	0	0
4.637497	3.302485	0	0	0	0
4.637497	3.382485	0	0	0	0
4.637497	3.462487	0	0	0	0
4.637497	3.542487	0	0	0	0
4.637497	3.622487	0	0	0	0
4.637497	3.702486	0	0	0	0
4.637497	3.782485	0	0	0	0
4.637497	3.862485	0	0	0	0
4.637497	3.942487	0	0	0	0
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4.637497	4.102488	0	0	0	0
4.637497	4.182486	0	0	0	0
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4.757495	4.362484	0	0	0	0
4.817495	4.412487	0	0	0	0
4.877497	4.462488	0	0	0	0
4.937497	4.587488	0	0	0	0

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4.937497	4.812488	0	0	0	0
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5.162495	1.574986	0	0	0	0
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5.599996	4.949987	0	0	0	0
6.199994	2.224987	0	0	0	0
5.599996	2.824986	0	0	0	0
7.399994	2.824986	0	0	0	0
7.399994	2.174989	0	0	0	0
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6.799995	1.574986	0	0	0	0
7.399994	3.299988	0	0	0	0
5.599996	3.299988	0	0	0	0
5.599996	3.349987	0	0	0	0
7.399994	3.349987	0	0	0	0
7.299997	4.312489	0	0	0	0
7.299997	3.349987	0	0	0	0
5.699994	3.349987	0	0	0	0
5.699994	4.312489	0	0	0	0
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5.699994	3.374989	0	0	0	0
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7.024998	3.862487	0	0	0	0
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7.024998	4.182486	0	0	0	0
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6.165904	3.062487	0	0	0	0
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4.78484  4.524991  0  0  0  0
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1053	1038	12	0	0	0	0	0
1055	1056	12	0	0	0	0	0
1057	1058	12	0	0	0	0	0
1059	1060	12	0	0	0	0	0
1061	1062	12	0	0	0	0	0
1063	1041	12	0	0	0	0	0

```
1065  1066  12  0  0  0  0  0
1067  1068  12  0  0  0  0  0
1069  1070  12  0  0  0  0  0
1071  1072  12  0  0  0  0  0
1073  1038  12  0  0  0  0  0
1075  1076  12  0  0  0  0  0
1077  1078  12  0  0  0  0  0
1079  1080  12  0  0  0  0  0
1081  1082  12  0  0  0  0  0
1083  1037  12  0  0  0  0  0
1085  1086  12  0  0  0  0  0
1087  1088  12  0  0  0  0  0
1089  1090  12  0  0  0  0  0
1090  1091  12  0  0  0  0  0
1092  1093  12  0  0  0  0  0
1094  1095  12  0  0  0  0  0
1095  1039  12  0  0  0  0  0
1020  1098  3  0  0  0  0  0
1109  1108  3  0  0  0  0  0
1099  1097  6  0  0  0  0  0
1102  1101  6  0  0  0  0  0
1104  1103  3  0  0  0  0  0
1107  1106  3  0  0  0  0  0
1105  1100  6  0  0  0  0  0
698  1099  6  0  0  0  0  0
776  1105  6  0  0  0  0  0
1114  1115  3  0  0  0  0  0
1116  1115  3  0  0  0  0  0
1117  1116  3  0  0  0  0  0
1117  1114  3  0  0  0  0  0
1117  860  6  0  0  0  0  0
1118  857  6  0  0  0  0  0
1119  858  6  0  0  0  0  0
1116  859  6  0  0  0  0  0
1122  1121  3  0  0  0  0  0
984  1122  3  0  0  0  0  0
984  1123  3  0  0  0  0  0
4.862495  2.824986  0  3  3.141592  4.712388  0  0  0  0  0
5.462494  2.824986  0
4.862495  3.424987  0
4.862495  2.174988  0  6  3.141592  4.712388  0  0  0  0  0
5.462498  2.174988  0
4.862495  2.774989  0
5.162495  3.724986  0  3  1.570797  3.141592  0  0  0  0  0
5.962497  3.724986  0
5.162495  4.124989  0
5.162495  3.749988  0  3  1.570797  3.141592  0  0  0  0  0
5.962497  3.749988  0
5.162495  4.149988  0
```

```
5.162495  4.174984  0  3  1.570797  3.141592  0  0  0  0  0
5.96247  4.174984  0
5.162495  4.724987  0
5.162495  4.149987  0  3  1.570797  3.141592  0  0  0  0  0
5.96247  4.149987  0
5.162495  4.699986  0
5.162495  4.312489  0  3  1.570797  3.141592  0  0  0  0  0
5.9625  4.312489  0
5.162495  4.952489  0
6.799993  2.824986  0  3 -1.570796  0  0  0  0  0  0
7.399994  2.824986  0
6.799993  3.424987  0
6.799995  2.174988  0  6 -1.570796  9.321062E-07  0  0  0  0  0
7.399994  2.174988  0
6.799995  2.774989  0
6.499995  4.312489  0  3  0  1.570798  0  0  0  0  0
7.3  4.312489  0
6.499995  4.952489  0
6.499995  3.749988  0  3  0  1.570798  0  0  0  0  0
7.299997  3.749988  0
6.499995  4.149989  0
6.499995  3.724987  0  3  0  1.570798  0  0  0  0  0
7.299997  3.724987  0
6.499995  4.124989  0
6.499995  4.174984  0  3  0  1.570798  0  0  0  0  0
7.299969  4.174984  0
6.499995  4.724987  0
6.499995  4.149988  0  3  0  1.570798  0  0  0  0  0
7.299969  4.149988  0
6.499995  4.699986  0
4.981843  4.324991  0  1  0  0  0  0  0  0  0
5.200738  4.324991  0
4.981843  4.449991  0
6.674241  4.324991  0  1  0  0  0  0  0  0  0
6.893134  4.324991  0
6.674241  4.449991  0
4.418745  5.02499  0  3  0  1.570796  0  0  0  0  0
4.518745  5.02499  0
4.418745  5.124989  0
4.368744  5.02499  0  3  1.570796  3.141592  0  0  0  0  0
4.468745  5.02499  0
4.368744  5.124989  0
7.293744  5.02499  0  3  0  1.570796  0  0  0  0  0
7.393745  5.02499  0
7.293744  5.124989  0
7.243744  5.02499  0  3  1.570796  3.141592  0  0  0  0  0
7.343745  5.02499  0
7.243744  5.124989  0
7.268745  5.037487  0  4  0  0  0  0  0  0  0
```

```
7.343745  5.037487  0
7.268745  5.112491  0
7.268745  4.999989  0  4  0  0  0  0  0  0  0
7.306244  4.999989  0
7.268745  5.037487  0
4.393745  5.037487  0  4  0  0  0  0  0  0  0
4.468745  5.037487  0
4.393745  5.112491  0
4.393745  4.999989  0  4  0  0  0  0  0  0  0
4.431244  4.999989  0
4.393745  5.037487  0
10.61856  3.349987  0  1  1.570796  2.380054  0  0  0  0  0
12.23713  3.349987 -2.009869E-08
10.61856  4.968545  0
7.583757  5.069713 -2.009869E-08  6  5.110262  6.256524  0  0  0  0  0
11.3695  5.069713 -2.009869E-08
7.583757  8.855446 -2.009869E-08
8.91692  1.98297 -2.009869E-08  6  2.574772  5.112052  0  0  0  0  0
9.341913  1.98297 -2.009869E-08
8.91692  2.407962 -2.009869E-08
10.61856  3.349987  0  7  2.380054  2.593831  0  0  0  0  0
12.23713  3.349987 -2.009869E-08
10.61856  4.968545  0
10.61856  3.349987  0  1  2.593831  3.141592  0  0  0  0  0
12.23713  3.349987 -2.009869E-08
10.61856  4.968545  0
9.341404  4.332356 -2.009869E-08  1  4.061312  .8902763  0  0  0  0  0
9.508326  4.332356 -2.009869E-08
9.341404  4.499277 -2.009869E-08
11.14122  4.968554 -2.009869E-08  3  3.141592  4.712412  0  0  0  0  0
11.2761  4.968554 -2.009869E-08
11.14122  5.103433 -2.009869E-08
11.11594  4.91797 -2.009869E-08  4  0  0  0  0  0  0  0  0
11.16652  4.91797 -2.009869E-08
11.11594  4.96855 -2.009869E-08
11.11594  4.91797 -2.009869E-08  4  0  0  0  0  0  0  0  0
11.14122  4.91797 -2.009869E-08
11.11594  4.943261 -2.009869E-08
10.58955  6.624062  0  3  0  1.299613  0  0  0  0  0
10.58955  5.808327  0
11.28086  6.624062  0
10.26276  6.617691  0  3  1.316958  1.824634  0  0  0  0  0
10.26276  5.801955  0
10.95407  6.617691  0
9.766275  6.617691  0  3  1.5708  3.141592  0  0  0  0  0
9.766275  7.433403  0
9.213226  6.617691  0
9.741137  6.617691  0  3  1.570799  3.141592  0  0  0  0  0
9.741137  7.433403  0
```

```
9.188089  6.617691  0
9.640579  6.617691  0  3  1.570799  3.141592  0  0  0  0  0
9.640579  7.433433  0
8.997032  6.617691  0
9.715994  6.617697  0  3  1.570803  3.141592  0  0  0  0  0
9.715994  7.535407  0
8.992003  6.617697  0
10.19363  6.617691  0  3  1.570796  3.141592  0  0  0  0  0
10.19363  7.433427  0
9.791412  6.617691  0
10.14336  6.617691  0  3  1.570797  3.141592  0  0  0  0  0
10.14336  7.43343   0
9.741135  6.617691  0
10.58955  6.624062  0  3  1.299613  1.562984  0  0  0  0  0
10.58955  5.808327  0
11.28086  6.624062  0
9.313782  6.617691  0  6  1.570798  3.141592  0  0  0  0  0
9.313782  7.535397  0
8.459072  6.617691  0
9.414333  6.617691  0  6  1.570798  3.141592  0  0  0  0  0
9.414333  7.535397  0
8.559624  6.617691  0
10.59082  7.952196  0  3  0  1.299613  0  0  0  0  0
10.59082  8.767931  0
11.28211  7.952194  0
10.26402  7.958568  0  3  1.316958  1.824634  0  0  0  0  0
10.26402  8.774303  0
10.95532  7.958568  0
9.767532  7.958565  0  3  1.5708  3.141592  0  0  0  0  0
9.767532  7.142854  0
9.214483  7.958565  0
9.742392  7.958566  0  3  1.570799  3.141592  0  0  0  0  0
9.742392  7.142854  0
9.189346  7.958566  0
9.641838  7.958566  0  3  1.570799  3.141592  0  0  0  0  0
9.641838  7.142825  0
8.998289  7.958566  0
9.717251  7.95856   0  3  1.570803  3.141592  0  0  0  0  0
9.717251  7.040853  0
8.993259  7.95856   0
10.19489  7.958569  0  3  1.570796  3.141592  0  0  0  0  0
10.19489  7.142828  0
9.792667  7.958569  0
10.14461  7.958568  0  3  1.570797  3.141592  0  0  0  0  0
10.14461  7.142827  0
9.742392  7.958568  0
10.59082  7.952196  0  3  1.299613  1.562984  0  0  0  0  0
10.59082  8.767931  0
11.28211  7.952194  0
```

```
9.315039  7.958566  0  6  1.570798  3.141592  0  0  0  0  0
9.315039  7.040863  0
8.460329  7.958566  0
9.41559  7.958566  0  6  1.570798  3.141592  0  0  0  0  0
9.41559  7.040863  0
8.560881  7.958566  0
9.364054  8.105976  0  1  0  0  0  0  0  0  0
9.364054  8.305976  0
9.2635  8.105976  0
9.364054  6.455975  0  1  0  0  0  0  0  0  0
9.364054  6.655976  0
9.2635  6.455975  0
7.149993  6.649989  0  6  6.056828  0  0  0  0  0  0
11.38297  6.649989  0
7.149993  10.88297  0
7.149993  7.924988  0  6  0  .2263562  0  0  0  0  0
11.37499  7.924988  0
7.149993  12.14999  0
11.07499  8.800335  0  3  1.575467  3.141592  0  0  0  0  0
11.14999  8.800335  0
11.07499  8.875336  0
11.07499  8.699986  0  3  3.141592  4.712388  0  0  0  0  0
11.14999  8.699986  0
11.07499  8.774984  0
11.09158  5.888987  0  3  1.502911  3.055492  0  0  0  0  0
11.16658  5.888987  0
11.09158  5.963985  0
11.08175  5.77499  0  3  3.055492  4.712381  0  0  0  0  0
11.15675  5.77499  0
11.08175  5.849989  0
11.05  8.749998  0  4  0  0  0  0  0  0  0
11.05  8.649998  0
11.09  8.749998  0
11.09  8.749998  0  4  3.785093  5.639682  0  0  0  0  0
11.09  8.631249  0
11.1375  8.749998  0
11.05825  5.835008  0  4  0  0  0  0  0  0  0
11.05825  5.735007  0
11.09825  5.835008  0
11.09825  5.835008  0  4  3.785093  5.639682  0  0  0  0  0
11.09825  5.716258  0
11.14575  5.835008  0
0  0  0  0  0
```

Data File DS3V.DIM: Dimensions File for the Dual-Place Encapsulated Seat

```
"2.00","DS3V192.CAD","IN",1,0,0
 1  687  765  1  1  .55  3.2  0  0  0  0  0  0  0
.15,.13,0,2,3,0,0,"60"
 2  859  1100  1  1 -.012  1.536  0  0  0  0  0  0  0
.15,.13,0,2,3,0,0,"60"
 1  3  224  1  1 -.712 -3.35  0  0  0  0  0  0  0
.15,.13,0,2,3,0,0,"65"
```

Data File DSEATXL.CAD: Subsystems Location File for the Dual-Place Encapsulated Seat

```
"2.00","","IN",1,0,0
 250  135  29  0  1  0  0  0  0  0  0  0  0  0  0
 9.437512  8.195283  2.980232E-08  0  0  0
 9.437512  4.995286  2.980232E-08  0  0  0
 6.237516  4.995286  2.980232E-08  0  0  0
 7.837513  7.745566 -2.980232E-08  0  0  0
 9.387523  5.195566  0  0  0  0
 6.637513  6.545567  0  0  0  0
 9.287513  5.095569  0  0  0  0
 7.787523  7.695567  0  0  0  0
 9.337524  5.145567  2.980232E-08  0  0  0
 6.687513  6.595568  0  0  0  0
 6.237518  5.045567  0  0  0  0
 9.237513  5.045567 -2.980232E-08  0  0  0
 10.93752  8.195294  0  0  0  0
 9.287513  4.895291  0  0  0  0
 6.237516  4.895291  2.980232E-08  0  0  0
 6.337503  4.894994  0  0  0  0
 5.474999  2.374997 -2.980232E-08  0  0  0
 5.374998  2.374997  0  0  0  0
 5.287502  1.994993  0  0  0  0
 5.437499  1.944992  0  0  0  0
 5.36251  2.744995  0  0  0  0
 5.487509  2.744995  0  0  0  0
 5.587508  2.994997  0  0  0  0
 5.425004  2.35 -2.980232E-08  0  0  0
 7.325009  2.35 -5.960464E-08  0  0  0
 7.525009  4.249999  5.960465E-08  0  0  0
 7.525009  4.199998  5.960465E-08  0  0  0
 8.97501  4.024997  5.960465E-08  0  0  0
 10.03751  8.094993  0  0  0  0
 9.9375  8.094993  0  0  0  0
 8.9  4.249998  0  0  0  0
 7.55001  4.399996  2.980233E-08  0  0  0
 8.775  4.149996  8.940697E-08  0  0  0
 7.475  4.374998  5.960465E-08  0  0  0
 7.45  4.324998  5.960465E-08  0  0  0
 7.475  4.249998  5.960465E-08  0  0  0
 6.375001  2.349999 -5.960464E-08  0  0  0
 6.962503  4.569995 -2.980232E-08  0  0  0
 6.837503  4.619996  0  0  0  0
 6.887503  5.119996  2.980232E-08  0  0  0
 6.862503  5.169994  0  0  0  0
 6.812503  5.169994 -2.980232E-08  0  0  0
 6.787503  5.119996  0  0  0  0
 6.737503  4.669994  0  0  0  0
 7.624999  4.149996  5.960465E-08  0  0  0
 8.825  3.974997  5.960465E-08  0  0  0
 8.862503  3.844994  0  0  0  0
```

```
7.662503  3.844994  0  0  0  0
9.212503  4.694994 -2.980232E-08  0  0  0
9.6125  6.119992 -2.980232E-08  0  0  0
10.23751  5.969994  0  0  0  0
9.6125  4.694994 -2.980232E-08  0  0  0
8.012503  2.769991 -2.980232E-08  0  0  0
7.162503  2.269991  0  0  0  0
6.937503  2.544993  0  0  0  0
5.846501  1.97649  0  0  0  0
9.53751  4.544992  0  0  0  0
10.16251  8.194993  0  0  0  0
9.78751  6.819993  0  0  0  0
10.36251  6.644992  0  0  0  0
10.71251  8.194993  0  0  0  0
9.7125  6.544991  0  0  0  0
9.6125  6.269994 -2.980232E-08  0  0  0
9.9375  6.144992  0  0  0  0
10.0625  6.494991  0  0  0  0
10.1625  8.019994  0  0  0  0
9.9875  7.394994  0  0  0  0
10.4625  7.294992 -5.960465E-08  0  0  0
10.6125  7.919992  0  0  0  0
10.3875  7.969993  0  0  0  0
10.2375  7.344993  5.960465E-08  0  0  0
10.05536  7.380708  0  0  0  0
10.12322  7.366418  0  0  0  0
10.19108  7.352134  0  0  0  0
10.25893  7.337848  0  0  0  0
10.32679  7.323564  0  0  0  0
10.39464  7.309277  0  0  0  0
10.25416  7.414434  0  0  0  0
10.27083  7.483878  0  0  0  0
10.2875  7.553323  5.960465E-08  0  0  0
10.30417  7.622767  0  0  0  0
10.32084  7.692212  0  0  0  0
10.3375  7.761659  5.960465E-08  0  0  0
10.35417  7.831101  5.960465E-08  0  0  0
10.37084  7.900548  0  0  0  0
10.00695  7.464437  0  0  0  0
10.02639  7.533883  0  0  0  0
10.04584  7.603322  0  0  0  0
10.06528  7.672771  0  0  0  0
10.08473  7.742212  5.960465E-08  0  0  0
10.10417  7.811658 -5.960465E-08  0  0  0
10.12362  7.881104 -5.960465E-08  0  0  0
10.14306  7.950546  0  0  0  0
10.47917  7.364438  0  0  0  0
10.49584  7.433877  0  0  0  0
10.5125  7.503325 -5.960465E-08  0  0  0
```

```
10.52917  7.572767 -5.960465E-08  0  0  0
10.54584  7.642213  0  0  0  0
10.5625  7.711658  0  0  0  0
10.57917  7.781102  0  0  0  0
10.59583  7.85055  0  0  0  0
6.312499  2.094991  0  0  0  0
6.912503  2.094991  0  0  0  0
6.912503  2.694991  0  0  0  0
6.312499  2.694991  0  0  0  0
6.012502  2.444991  0  0  0  0
6.312499  2.444991  0  0  0  0
6.312499  2.344991  0  0  0  0
6.012502  2.344991  0  0  0  0
6.1455  2.242995  0  0  0  0
5.7  2.242995  0  0  0  0
5.7  1.999996  0  0  0  0
6.1455  1.999996  0  0  0  0
6.1455  2.080995  0  0  0  0
6.3885  2.080995 -2.980232E-08  0  0  0
6.3885  2.323994 -2.980232E-08  0  0  0
6.3075  2.323994  0  0  0  0
6.3075  2.161994  0  0  0  0
6.1455  2.161994  0  0  0  0
5.862002  2.242995  0  0  0  0
5.862002  2.323994  0  0  0  0
5.781  2.323994  0  0  0  0
5.781  2.242995  0  0  0  0
7.605203  2.056297  0  0  0  0
8.348343  2.725428  0  0  0  0
7.872853  1.759038  0  0  0  0
8.616003  2.42817  0  0  0  0
9.8512  4.302299  0  0  0  0
9.182073  3.559154  0  0  0  0
10.14846  4.034645  0  0  0  0
9.479333  3.291502 -2.980232E-08  0  0  0
9.047854  2.718217  0  0  0  0
9.189282  2.859641  0  0  0  0
9.472123  2.718219  0  0  0  0
9.189282  2.435378  0  0  0  0
9.056693  3.062933  0  0  0  0
9.189282  3.283905  0  0  0  0
9.268833  3.239709 -2.980232E-08  0  0  0
9.136243  3.018741  0  0  0  0
8.888763  2.771252  0  0  0  0
8.667793  2.63867 -2.980232E-08  0  0  0
8.623594  2.718217  2.980232E-08  0  0  0
8.835723  2.841963  0  0  0  0
8.561723  2.355828  0  0  0  0
8.694303  2.453054  0  0  0  0
```

```
8.747343  2.382344  0  0  0  0
8.614753  2.285116  0  0  0  0
8.729663  2.400022 -2.980232E-08  0  0  0
9.092053  2.620992 -2.980232E-08  0  0  0
9.083213  2.647509  0  0  0  0
8.720823  2.426538  0  0  0  0
9.55167  3.345777  0  0  0  0
9.454443  3.213193  0  0  0  0
9.52515  3.16016  0  0  0  0
9.62238  3.292743  0  0  0  0
9.50747  3.177837 -2.980232E-08  0  0  0
9.286503  2.815445 -2.980232E-08  0  0  0
9.259993  2.824285  0  0  0  0
9.480963  3.186677  2.980232E-08  0  0  0
8.473332  2.267437 -2.980232E-08  0  0  0
8.756173  2.514925  0  0  0  0
8.844563  2.391181  0  0  0  0
8.561723  2.143693 -2.980232E-08  0  0  0
8.818043  2.435375  0  0  0  0
9.065533  2.682863  0  0  0  0
8.791534  2.461892  0  0  0  0
9.392572  3.151321  5.960465E-08  0  0  0
9.64006  3.434165  0  0  0  0
9.7638  3.345777  0  0  0  0
9.51631  3.062933  0  0  0  0
9.445602  3.115965 -2.980232E-08  0  0  0
9.224633  2.841961  0  0  0  0
9.472123  3.089449 -2.980232E-08  0  0  0
6.612503  1.569996  0  0  0  0
6.712503  1.669995  0  0  0  0
7.837503  1.669995  0  0  0  0
9.012503  2.344997  2.980232E-08  0  0  0
9.012503  2.244996  2.980232E-08  0  0  0
7.837503  1.569996  0  0  0  0
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10.3625  4.169994  0  0  0  0
9.6875  2.919995  5.960465E-08  0  0  0
9.5875  2.919995 -2.980232E-08  0  0  0
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10.2625  5.269998  0  0  0  0
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9.5125  1.444996  0  0  0  0
9.91251  1.344997 -5.960465E-08  0  0  0
10.8625  5.644999  5.960465E-08  0  0  0
10.82  8.189999  0  0  0  0
10.82  8.429998  0  0  0  0
10.26  8.429998  0  0  0  0
10.2  8.249998  0  0  0  0
10.46  7.989999  0  0  0  0
```

```
10.8  7.989999  0  0  0  0
10.2  8.249998  0  0  0  0
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10.43  8.259997  0  0  0  0
10.62  8.279998  0  0  0  0
10.62  8.349999  0  0  0  0
10.82  8.359998  0  0  0  0
10.95  7.449997  0  0  0  0
11.3  7.299995  0  0  0  0
7.600004  3.749998  0  0  0  0
7.650004  3.099998  0  0  0  0
8.300003  3.099998  0  0  0  0
8.300003  3.749998  0  0  0  0
6.700001  3.649998  0  0  0  0
5.900002  3.799998  0  0  0  0
.5  .5000006  0  0  0  0
3.5  .5000006  0  0  0  0
8.825  3.674998  0  0  0  0
7.624999  3.674998  0  0  0  0
6.124999  4.074998  0  0  0  0
5.549998  2.674998  0  0  0  0
6.124999  2.474998  0  0  0  0
6.699999  3.874998  0  0  0  0
5.800001  8.599997  0  0  0  0
7.500001  7.599997  0  0  0  0
7.000001  6.899996  0  0  0  0
3.400001  7.199996  0  0  0  0
4.1  6.199996  0  0  0  0
6.7  4.399997  0  0  0  0
4.2  5.199997  0  0  0  0
4.2  4.299997  0  0  0  0
6.3  4.199997  0  0  0  0
6.1  3.199997  0  0  0  0
4.4  3.199997  0  0  0  0
4.099999  2.199997  0  0  0  0
5.699999  1.599997  0  0  0  0
3.6[illegible]999  1.499997  0  0  0  0
9.799999  1.499997  0  0  0  0
11.6  1.499997  0  0  0  0
11.6  2.599997  0  0  0  0
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11.6  3.599997  0  0  0  0
7.999998  3.299997  0  0  0  0
8.4  3.799997  0  0  0  0
11.6  4.099997  0  0  0  0
11.6  5.099997  0  0  0  0
9.199999  4.499996  0  0  0  0
11.6  6.199997  0  0  0  0
9.900002  6.499996  0  0  0  0
```

```
10.2  7.099997  0  0  0  0
11.6  7.099997  0  0  0  0
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11.6  8.799997  0  0  0  0
9.800005  8.299995  0  0  0  0
9.000006  8.799994  0  0  0  0
2  1  3  0  0  0  0  0
3  2  3  0  0  0  0  0
4  5  3  0  0  0  0  0
6  7  3  0  0  0  0  0
8  9  3  0  0  0  0  0
10  9  3  0  0  0  0  0
11  12  3  0  0  0  0  0
1  13  3  0  0  0  0  0
15  14  3  0  0  0  0  0
15  3  3  0  0  0  0  0
21  15  3  0  0  0  0  0
22  16  3  0  0  0  0  0
22  23  3  0  0  0  0  0
24  25  2  0  0  0  0  0
25  26  2  0  0  0  0  0
26  28  2  0  0  0  0  0
28  29  2  0  0  0  0  0
30  29  2  0  0  0  0  0
31  30  2  0  0  0  0  0
32  33  2  0  0  0  0  0
34  32  2  0  0  0  0  0
35  34  2  0  0  0  0  0
35  36  2  0  0  0  0  0
36  26  2  0  0  0  0  0
37  38  2  0  0  0  0  0
16  38  2  0  0  0  0  0
39  40  2  0  0  0  0  0
41  40  2  0  0  0  0  0
42  41  2  0  0  0  0  0
43  42  2  0  0  0  0  0
44  43  2  0  0  0  0  0
45  46  5  0  0  0  0  0
59  58  5  0  0  0  0  0
59  60  5  0  0  0  0  0
60  61  5  0  0  0  0  0
63  62  5  0  0  0  0  0
63  64  5  0  0  0  0  0
64  65  5  0  0  0  0  0
67  86  2  0  0  0  0  0
67  72  2  0  0  0  0  0
68  94  2  0  0  0  0  0
71  78  2  0  0  0  0  0
```

73	74	2	0	0	0	0	0
74	75	2	0	0	0	0	0
75	76	2	0	0	0	0	0
77	68	2	0	0	0	0	0
79	80	2	0	0	0	0	0
81	82	2	0	0	0	0	0
83	84	2	0	0	0	0	0
85	70	2	0	0	0	0	0
86	87	2	0	0	0	0	0
88	89	2	0	0	0	0	0
89	90	2	0	0	0	0	0
91	92	2	0	0	0	0	0
93	66	2	0	0	0	0	0
95	96	2	0	0	0	0	0
96	97	2	0	0	0	0	0
98	99	2	0	0	0	0	0
99	100	2	0	0	0	0	0
101	69	2	0	0	0	0	0
124	125	4	0	0	0	0	0
126	127	4	0	0	0	0	0
129	128	4	0	0	0	0	0
131	130	4	0	0	0	0	0
132	133	4	0	0	0	0	0
133	134	4	0	0	0	0	0
135	134	4	0	0	0	0	0
132	135	4	0	0	0	0	0
136	137	4	0	0	0	0	0
139	138	4	0	0	0	0	0
141	140	4	0	0	0	0	0
142	143	4	0	0	0	0	0
160	161	4	0	0	0	0	0
161	162	4	0	0	0	0	0
163	162	4	0	0	0	0	0
163	162	4	0	0	0	0	0
160	163	4	0	0	0	0	0
164	150	4	0	0	0	0	0
166	165	4	0	0	0	0	0
167	168	4	0	0	0	0	0
168	169	4	0	0	0	0	0
170	169	4	0	0	0	0	0
167	170	4	0	0	0	0	0
172	171	4	0	0	0	0	0
158	173	4	0	0	0	0	0
174	175	3	0	0	0	0	0
175	176	3	0	0	0	0	0
176	177	3	0	0	0	0	0
178	177	3	0	0	0	0	0
179	178	3	0	0	0	0	0
174	179	3	0	0	0	0	0

```
181   180   3   0   0   0   0   0
182   181   3   0   0   0   0   0
183   182   3   0   0   0   0   0
183   184   3   0   0   0   0   0
184   185   3   0   0   0   0   0
185   180   3   0   0   0   0   0
187   188   4   0   0   0   0   0
190   191   3   0   0   0   0   0
192   191   3   0   0   0   0   0
193   192   3   0   0   0   0   0
196   193   3   0   0   0   0   0
194   195   3   0   0   0   0   0
192   197   4   0   0   0   0   0
193   198   4   0   0   0   0   0
199   190   4   0   0   0   0   0
200   201   4   0   0   0   0   0
187   202   4   0   0   0   0   0
202   203   4   0   0   0   0   0
188   203   4   0   0   0   0   0
212   46   5   0   0   0   0   0
213   212   5   0   0   0   0   0
213   45   5   0   0   0   0   0
215   214   5   0   0   0   0   0
215   216   5   0   0   0   0   0
216   217   5   0   0   0   0   0
214   217   5   0   0   0   0   0
218   219   7   0   0   0   0   0
221   220   7   0   0   0   0   0
222   3   7   0   0   0   0   0
224   223   7   0   0   0   0   0
225   226   7   0   0   0   0   0
228   227   7   0   0   0   0   0
229   113   7   0   0   0   0   0
231   230   7   0   0   0   0   0
232   233   7   0   0   0   0   0
235   234   7   0   0   0   0   0
237   236   7   0   0   0   0   0
238   239   7   0   0   0   0   0
241   240   7   0   0   0   0   0
243   242   7   0   0   0   0   0
244   245   7   0   0   0   0   0
247   246   7   0   0   0   0   0
200   248   7   0   0   0   0   0
250   249   7   0   0   0   0   0
9.437512   4.995283   2.980232E-08   1   1.570796   2.380054   0   0   0   0   0
12.63752   4.995283   0
9.437512   8.195283   2.980232E-08
9.437512   4.995286   2.980232E-08   3   0   0   0   0   0   0   0
9.63752   4.995286   2.980232E-08
```

```
9.437512  5.195284  2.980232E-08
3.437513  8.495282  0  3  5.115503  6.242666  0  0  0  0  0
10.83008  8.495282  5.960465E-08
3.437513  15.88784  0
3.437517  8.395293  0  6  5.110262  6.256524  0  0  0  0  0
10.92217  8.395293  0
3.437517  15.87995  0
6.073266  2.2926  0  6  2.574772  5.112052  0  0  0  0  0
6.913503  2.2926  0
6.073266  3.132835  0
6.087501  2.394994  0  13  2.613512  5.05542  0  0  0  0  0
6.794603  2.394994  0
6.087501  3.1021  0
8.875  4.149996  2.980233E-08  6  0  0  0  0  0  0  0
8.97501  4.149996  5.960465E-08
8.875  4.249999  2.980233E-08
9.88751  6.519992  0  5  0  0  0  0  0  0  0
10.0625  6.519992  0
9.88751  6.694993  0
10.33751  7.969993  5.960465E-08  14  0  0  0  0  0  0  0
10.4375  7.969993  0
10.33751  8.069993  5.960465E-08
10.33751  7.969993  5.960465E-08  14  0  0  0  0  0  0  0
10.51251  7.969993 -5.960465E-08
10.33751  8.144994  5.960465E-08
10.2725  7.999992  5.960465E-08  2  6.059707  2.918115  0  0  0  0  0
10.38531  7.999992  0
10.2725  8.112798  5.960465E-08
10.5025  7.944993  0  2  6.059707  2.927534  0  0  0  0  0
10.6153  7.944993 -5.960465E-08
10.5025  8.057798  0
8.482173  2.576798  0  4  4.712388  1.570796  0  0  0  0  0
8.630803  2.710623 -2.980232E-08
8.348343  2.725428  0
7.739023  1.907668  0  4  1.570796  4.712388  0  0  0  0  0
7.887652  2.041493  0
7.605203  2.056297  0
9.330703  3.425327 -2.980232E-08  4  4.712388  1.570796  0  0  0  0  0
9.196873  3.276697  0
9.182073  3.559154  0
9.99983  4.168471  5.960465E-08  4  1.570796  4.712388  0  0  0  0  0
9.866  4.019843 -5.960465E-08
9.8512  4.302299  0
9.012503  2.894996  2.980232E-08  4  5.30039  4.124386  0  0  0  0  0
9.139983  3.022471  2.980232E-08
8.885023  3.022472  0
6.087501  2.364995  0  3  2.553589  5.069522  0  0  0  0  0
6.808613  2.364995  0
6.087501  3.086104  0
```

```
9.437512  4.995283  2.980232E-08  2  2.380054  2.593831  0  0  0  0  0
12.63752  4.995283  0
9.437512  8.195283  2.980232E-08
9.437512  4.995283  2.980232E-08  1  2.593831  3.141592  0  0  0  0  0
12.63752  4.995283  0
9.437512  8.195283  2.980232E-08
6.912503  6.937493  0  1  4.061312  .8902763  0  0  0  0  0
7.242513  6.937493  0
6.912503  7.267504  0
10.46  8.249998  0  3  3.141592  4.712388  0  0  0  0  0
10.72  8.249998  0
10.46  8.509998  0
10.47  8.089998  0  4  0  0  0  0  0  0  0
10.55001  8.089998  0
10.47  8.169999  0
10.47  8.089998  0  4  0  0  0  0  0  0  0
10.5  8.089998  0
10.47  8.119999  0
10.48  8.289997  0  4  3.785093  2.034443  0  0  0  0  0
10.53  8.289997  0
10.48  8.339997  0
10.59  8.309998  0  4  1.107149  5.30039  0  0  0  0  0
10.63472  8.309998  0
10.59  8.354719  0
6.650004  4.400001  0  5  0  0  0  0  0  0  0
6.850005  4.400001  0
6.650004  4.6  0
7.974998  3.274998  0  5  0  0  0  0  0  0  0
8.324997  3.274998  0
7.974998  3.624997  0
6.074998  1.999997  0  5  0  0  0  0  0  0  0
6.399998  1.999997  0
6.074998  2.324996  0
```

Data File DSEATXN.NOT: Subsystems Note File for the Dual-Place Encapsulated Seat

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"2.00","DSEATXL.CAD","IN",1,0,0
 1 -8.637512  .804718  .15  .129  7  0  4 -3  0  0  0  0  0
"FABRIC DOOR _ NICALON THERMAL BLANKET

 1 -6.937512 -.8952823  .15  .129  7  0  4 -3  0  0  0  0  0
"WINDOW

 1 -6.937512 -1.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"PRESSURE SEAL

 1 -6.937512 -2.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"DOOR REELS (2)

 1 -6.937512 -3.895282  .15  .129  7  0  4 -3  0  0  0  0  0
"INSTRUMENTS

 1 -8.637512 -6.495283  .15  .129  7  0  4 -3  0  0  0  0  0
"RCC HEAT SHIELD / OUTER SHELL

 1 -1.637512  .8047142  .15  .129  7  0  4 -3  0  0  0  0  0
"STOWED DOOR POSITION

 1  2.362488 -.995286  .15  .129  7  0  4 -3  0  0  0  0  0
"MAIN AND DROGUE

 1  2.362488 -5.595286  .15  .129  7  0  4 -3  0  0  0  0  0
"ROCKET PROPULSION SYSTEM

 1  2.362488 -6.795286  .15  .129  7  0  4 -3  0  0  0  0  0
"CATAPULT TUBES (2)

 1 -6.937513 -4.795283  .15  .129  7  0  4 -3  0  0  0  0  0
"CONTROLLER/SEQUENCER

 1 -6.937513 -5.795283  .15  .129  7  0  4 -3  0  0  0  0  0
"LIFE SUPPORT SYSTEM

 1  2.362489  .7047148  .15  .129  7  0  4 -3  0  0  0  0  0
"ATTITUDE CONTROL

 1  2.362489 -.2952852  .15  .129  7  0  4 -3  0  0  0  0  0
"TRACTOR ROCKETS (3)
```

```
 1  2.362489 -2.095285  .15  .129  7  0  4 -3  0  0  0  0  0
"INERTIAL REELS (2)

 1  2.362489 -3.095285  .15  .129  7  0  4 -3  0  0  0  0  0
"SEATS (2)

 1  2.362489 -4.095285  .15  .129  7  0  4 -3  0  0  0  0  0
"SURVIVAL KITS (2)

 1  2.362489 -4.595286  .15  .129  7  0  4 -3  0  0  0  0  0
"ATTITUDE CONTROL
SYSTEM PROPELLANT
",0
```